RECOMMENDATIONS FOR WILDLIFE MANAGEMENT IN BEAUDRY PROVINCIAL PARK DEVELOPED FROM AN INVENTORY OF ITS WILDLIFE AND NATURAL VEGETATION

by

Liese Dorber

A Practicum Submitted
In Partial Fulfillment of the
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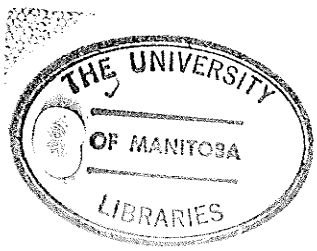

ABSTRACT

Bordering the City of Winnipeg, Beaudry Provincial Park will be the focus of an ever-increasing demand for outdoor recreation opportunities by this City's residents. Given this demand, the small total acreage of this as yet undeveloped park, and the given objective of preservation/conservation of the park's endowment of natural environment for the maximum benefit of the public, a vegetation and wildlife inventory and analysis must be provided prior to the formulation of specific plans for Beaudry Provincial Park if impairment of the natural environment is to be minimized. The objectives of this Practicum are to provide an inventory of the natural vegetation and wildlife of Beaudry Provincial Park and from the inventory data, identify and classify wildlife habitats within Beaudry Provincial Park, and recommend management options to maintain and/or enhance the diversity and abundance of wildlife species and their habitat within the park.

It is concluded that Beaudry Provincial Park is endowed with a great diversity of plant, avian and mammalian life as a function of the diversity of habitats existing within these park lands. Six "Wildlife Management Recommendations" to maintain and/or enhance the diversity and abundance of the wildlife species of Beaudry Provincial Park are proposed. Measures suggested to realize the proposed recommendations are habitat management through vegetation management and the application of the Land-Use Zones for Manitoba's Parks (a slightly modified version of the zoning system outlined in Criteria for the Provincial Park Lands System is used), prohibition of consumptive recreational use of the wildlife resource in Beaudry Provincial Park, re-introduction of certain wildlife species, and the development of an Interpretative Plan.

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Chapter 1

INTRODUCTION

1.1 The Problem Statement

It is the intention of the Parks Branch, Manitoba Department of Tourism, Recreation and Cultural Affairs, to develop Beaudry Natural Provincial Park in the near future. Located thirteen miles west of the forks of the Red and Assiniboine Rivers, Beaudry Park is readily accessible from Manitoba's major urban centre (Winnipeg). Beaudry Natural Provincial Park covers an area of approximately two thousand, three hundred (2,300) acres adjacent to both banks of the Assiniboine River.

Parks Branch has recognized that Beaudry Park's close proximity to the largest population concentration in Manitoba and the demand for outdoor recreation generated by this centre predisposes these park lands to intensive outdoor recreational use and consequently, Parks Branch has formulated the following goal for Beaudry Natural Provincial Park:

> "To foster and encourage stewardship and to increase the awareness of and the appreciation for Manitoba's natural and cultural heritage through the preservation and interpretation of a regionally significant natural environment and man's historical interaction with it." (Parks Branch, 1976:19).

To ensure the achievement of this goal, Parks Branch has delineated five objectives to guide the planning and development of Beaudry Natural Park. These objectives are:

1. To provide a park information program which is both a recreational activity and an educational experience;
2. To create a pride in Winnipeg's River Corridors and in Winnipeg's history as a settlement which developed along those Rivers; and secondly, to stimulate thought regarding this dynamic city's future;

3. To provide an introduction to the Manitoba Park System;
4. To perpetuate examples of vanishing natural communities, such as River Floodplain Forest, Tall Grass Prairie, and a Wetland; and to set aside an area of open space near Winnipeg, and
5. To provide on a year-round basis a range of outdoor recreation opportunities which are in harmony with the other Park objectives and which can be enjoyed by both individuals and groups of all ages and abilities." (Schick, personal communication, 1977).

Given the great demand for outdoor recreation generated by Winnipeg residents, the proposed park uses outlined in the preceeding objectives and the emphasis upon the preservation of the natural environment present in Beaudry Park, a vegetation and wildlife inventory and analysis must be provided prior to the formulation of specific plans for Beaudry Park. The inventory and analysis provides the data base necessary for the comprehensive consideration of this park's flora and fauna required if impairment of the natural environment of Beaudry Park is to be minimized.

1.2 Description of the Study Area[1]

1.2.1 Location

Beaudry Natural Provincial Park straddles both banks of the Assiniboine River approximately six to seven miles west of Winnipeg's Perimeter Highway (see Map 1). The boundaries of Beaudry Park encompass portions of Rivers Lots thirty-two, thirty-three and thirty-four of the Parish of

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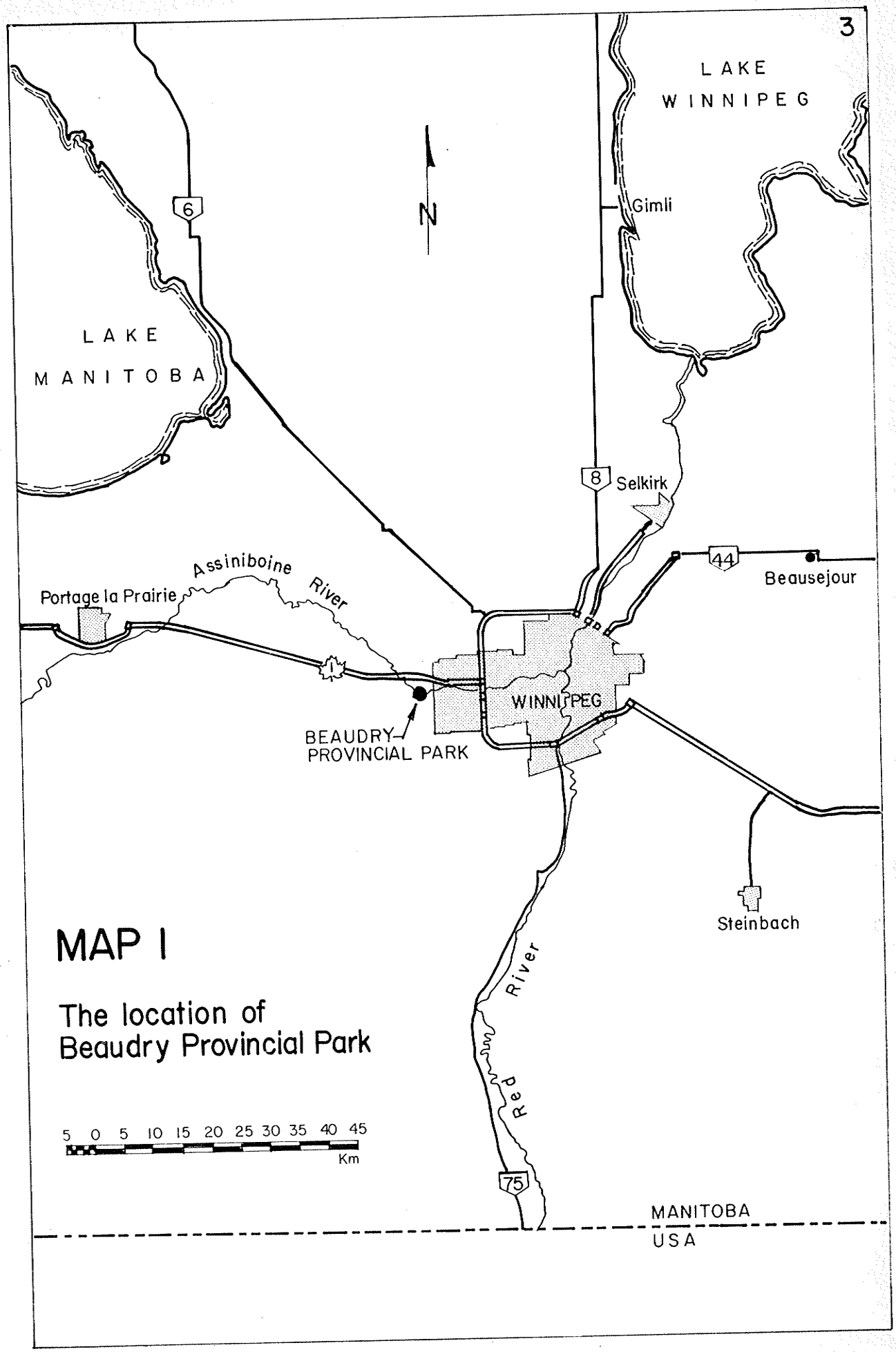
[1] A detailed account of the History of Beaudry Provincial Park's acquisition, a review of Beaudry Park's Historical Setting, and a detailed description of the physical features of the park are provided in Appendix B.



MAP 1

The location of
Beaudry Provincial Park

Headingley, portions of River Lots two hundred and twenty-two and two hundred and twenty-seven inclusive, and portions of River Lots two hundred and ten to two hundred and sixteen inclusive of the Parish of Saint Francois Xavier, as well as portions of River Lots four to nineteen inclusive and portions of River Lots twenty and twenty-one of the Parish of Saint Francois Xavier (see Map 2). The legal description of these park lands are given in Appendix A.

These lands were acquired since 1974 when the Land Utilization Board[1] first received the recommendation to purchase land along the Assiniboine River, specifically land near Headingley, Manitoba for its recreational and biological value (Parks Branch, 1976). Originally, the Province had hoped to acquire 1,600 acres immediately west of Winnipeg's city limits which included lands held by Peninsula Estates, Ltd., Harvard Investments Ltd., Peter Andrushko and Otto and Arnold Ammeter, as well as Headingley Provincial Jail Farm Property (see Map 2). However, the properties acquired through expropriation and thus, the lands designated as Beaudry Provincial Park by an Order-in-Council in 1975 were restricted to the properties once owned by Peninsula Estates Ltd., and Harvard Investments Ltd.[2] Portions of the Headingley Provincial Jail Farm Property were also acquired for inclusion in Beaudry Park, however they have not been designated as such by Order-in-Council to this date (Schick, personal communication, 1978). By virtue of the Provincial Park Lands Act and according to the Criteria for the Provincial Park Lands (1974) all the Park Lands

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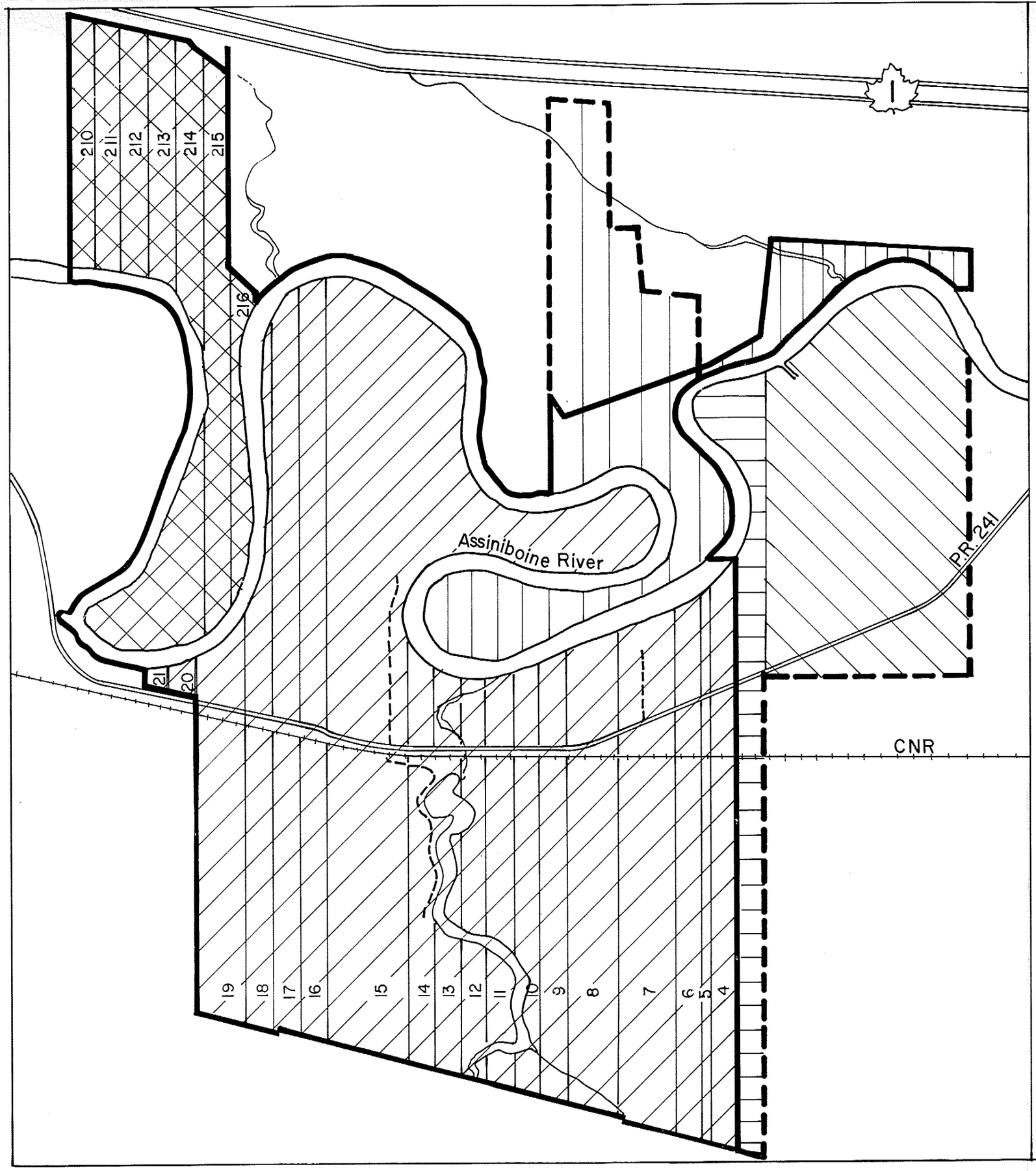
[1] The Land Utilization Board is an inter-departmental Board, administered under the Department of Renewable Resources and Transportation Services. It functions to coordinate and authorize the purchase of lands for a wide variety of recreational purposes (MacPherson, 1976).

[2] The lands adjacent to the park containing an oxbow of the river, owned by Peter Andrushko and the Ammeter brothers were not acquired as agreements to sell could not be reached.



MAP 2

The proposed boundaries of Beaudry Provincial Park, the required lands and the present boundary and location of original river lots

- Harvard Investments Limited
- Peter Andrushko
- Otto and Arnold Ammeter
- Headingly Provincial Jail Property
- Peninsula Estates Limited
- Proposed Limit of Park Lands

- Limit of Park Lands
- Unpaved Roads

NORTH

0 500 1000
metres

acquired by the Province of Manitoba described in Appendix A are designated as a Natural Park.

1.2.2 Brief Description of Lands Acquired

Peninsula Estates Limited Property

In the early seventies, the International Biological Program (IBP) identified the tract of riverbottom forest present on the peninsula created by the meanderings of the Assiniboine River (Map 2) as meriting preservation and protection. The peninsula composes one-half of the total Peninsula Estates Ltd. property (hereafter referred to as the Sair property). The remaining one-half extends north from the Assiniboine River to the Trans-Canada Highway. With the exception of small areas of oak forest and aspen forest, this land is presently cultivated field. The first Notice of Intended Expropriation of the three hundred (300) acre "Sair property" was filed in April, 1973. The second Notice of Intended Expropriation was filed in April, 1974, after which the purchase agreement was established.

Harvard Investments Limited Property

The Harvard Investments Ltd. property (hereafter referred to as Beaudry) is approximately one thousand, seven hundred (1,700) acres in size and represented the largest tract of land to be acquired. It possesses a number of attributes which deemed it highly desirable for a recreation area. These attributes are a peninsula covered with riverbottom forest which also has been identified by the International Biological Program (IBP) as deserving Ecological Preserve status, a reservoir providing waterfowl habitat, an upland oak forest providing habitat for a resident white-tailed deer herd and an area of renament tall grass prairie. The remaining acres consist of cultivated field and abandoned residential and agricultural land. Expropriation proceedings resulted when a selling price could not be reached. The land transaction was completed in 1975.

Headingley Provincial Jail Farm Property

The portions of this Crown Land which were designated as Beaudry Provincial Park are hereafter referred to as the Jail Property. Although lacking in ecological significance as a result of severe disturbance of the natural vegetation (riverbottom forest) in the past, these lands neighbour the Beaudry property and thereby, provide added protection of the Assiniboine River bank and the Beaudry IBP site. Possession and ownership of these lands were given to the Department of Tourism, Recreation and Cultural Affairs in August, 1976. As indicated earlier, these lands have not been designated as a portion of Beaudry Provincial Park by Order-in-Council to this date (1978).

1.2.3 Access

Beaudry Natural Provincial Park is readily accessible from Winnipeg as is illustrated in Map 1. The access route to the park lands bordering the northern bank of the Assiniboine River is the Trans-Canada Highway. The majority of the park lands, those lands lying to the south of the Assiniboine River, are accessible by Manitoba Provincial Road #241. Beaudry Park is approximately eighteen (18) miles or 35 to 40 minutes of driving distance from the centre of Winnipeg (Wang, 1977:1).

1.2.4 Physical Description of the Study Area[1]

The climate of Beaudry Natural Provincial Park has been designated as dominantly subhumid, cool continental characterized by higher summer and lower winter temperatures than the world average for the same latitude (Michalyna, et al., 1975). The average annual precipitation and average annual temperature for Headingley, Manitoba were considered representative

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[1] Detailed descriptions of the physical characteristics are provided in Appendix B.

of those at Beaudry Park.[1] The average annual temperature for July is 66-68°F and the average annual temperature for January is 0-2°F (Weir, 1960). The average annual precipitation is 19 to 20 inches. This figure includes an average annual snowfall of 50 to 55 inches (Weir, 1960).

The bedrock of Beaudry Provincial Park consists of rocks formed in the Silurian period belonging to the formations of the Interlake Group (Michalyna et al., 1975). The upper portion of this formation is absent here as a function of its location at the eastern erosion edge of pre-middle Devonian erosion forces. Beaudry Provincial Park, located in the Red River Plain of Manitoba exhibits the glacio-lacustrine and alluvial surface deposits and level topography characteristic of this physiographic region. These features are the result of the processes of glaciation, subsequent inundation by Glacial Lake Agassiz, and its recession during the Pleistocene epoch. Although level topographically, the low ridge and swale microrelief which occurs in the Red River Plain as a result of the alternating occurrence of the Red River and Osborne Soil Series is discernable in the cultivated portions of Beaudry Provincial Park. In addition, micro-relief in the form of meander scrolls and troughs, formed by the deposition of sediment by the Assiniboine River occur on the three meander peninsulas.

The soils of Beaudry Park have been mapped as belonging to the Dencross, Fisher, Fort Garry, Osborne, Red River, St. Norbert, Scanterbury, and Seine River Soil Series (Michalyna et al., 1975 and Ehrlich et al., 1953). (See Appendix B for a soils map for Beaudry Provincial Park).

The Assiniboine River Floodplain is several times the width of the Assiniboine River channel and is well defined as a result of its position

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[1] Records of the temperature and precipitation during the period of field research required for this report are included in Appendix L.

fifteen to twenty feet below the adjacent plains (Hilderman et al., 1974). The three meander peninsulas of Beaudry Provincial Park are located in this floodplain and support outstanding tracts of riverbottom forest. As previously mentioned, the riverbottom vegetation present on two of the peninsulas have been identified as meriting preservation and protection by the International Biological Programme.

1.3 Research Objectives

1. To provide an inventory and description of the natural vegetation and the wildlife of Beaudry Natural Provincial Park;
2. To identify and classify wildlife habitats within Beaudry Natural Provincial Park boundaries on the basis of the above wildlife study and vegetation study; and
3. To recommend management options to:
   a. preserve and protect wildlife species and habitats while permitting interpretation of these resources on a year-round basis, and
   b. maintain a diversity of species and habitats to permit a varied program to interpret the various habitat types and succession stages in a natural area.

1.4 Delimitations

This research project will be solely concerned with the fauna and flora comprising habitats currently existing within Beaudry Park's boundaries.

The conclusions and recommendations of this research are based upon one summer of actual field research.[1]

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[1] Field investigations were often hampered by time, manpower, equipment and weather constraints. In addition the field investigations were organized so as to provide a degree of standardization of techniques with similar inventories being conducted in three other provincial parks during the summer 1977. Since this standardization centred upon breeding-bird census plots deficiencies in vegetation sampling technique and data may result.

This research will not delineate the potential impacts of agricultural, industrial, and residential development within Beaudry Park's vicinity, proposed recreational development within the Park, or natural process (fire, floods, succession) upon the Park's flora and fauna.

1.5 Definition of Terms

Wildlife - All undomesticated mammals, birds, reptiles and amphibians living free in the wild.

Flora - Vascular plants in Beaudry Provincial Park.

Fauna - Terrestrial wildlife in Beaudry Provincial Park.

Habitat - The typical abiotic and biotic surroundings presently capable of supporting an animal or group of animals.

Outdoor Recreation - Recreational activities which occur in an outdoor (natural) environment and which relate directly to that environment and therefore, are resource-oriented activities.

Non-Consumptive Recreation - Passive recreational activities which provide a human experience through resource-dependent satisfactions that do not "consume" the resource.

Non-consumptive Wildlife Management - "the protection or provision of all wildlife for recreational use other than extractive sport" (Fazio and Belli, 1977:117).

Natural area - Tracts of land undisturbed by agricultural, industrial, residential, or recreational development.

Preservation - Protection without the intention of direct use other than for scientific observation such that the ecosystem is allowed to evolve naturally.

Conservation – Protection and maintenance with the intention of maximum yield and use (current or future use), through management based upon ecological principles.

Manitoba Provincial Parks – All park lands designated under the Provincial Park Lands Act.

1.6 Research Assumption

The assumption of this research project is that the field research data collected in specific areas of Beaudry Provincial Park over the course of summer 1977, although qualified according to the conditions existing in that summer, provide reliable estimates of the distribution and abundance of the natural vegetation and wildlife present within these park lands.

1.7 Research Methodology

Objective 1: To provide an inventory and description of the natural vegetation and wildlife of Beaudry Natural Provincial Park

To meet the inventory objectives for this study specific areas of Beaudry Provincial Park were chosen for intensive vegetation study and small mammal trapping. These areas were chosen such that each natural vegetation type currently found in Beaudry Provincial Park would be sampled. The specific areas, listed in Table 1 and illustrated in Map 3, were the most extensive and representative areas of each natural vegetation type. The three peninsulas of riverbottom vegetation were sampled to determine whether any differences did exist between areas of riverbottom forest in Beaudry Park. Two breeding-bird censuses were also carried out in two riverbottom peninsulas: The Beaudry Riverbottom peninsula and the Sair Riverbottom peninsula. A second component of the field inventory of the vegetation and wildlife of Beaudry Provincial Park was the continuous record of all species observed during the summer of 1977. The field inven-

Table 1. General Areas of Beaudry Provincial Park Chosen for Vegetation Sampling and Small Mammal Trapping*

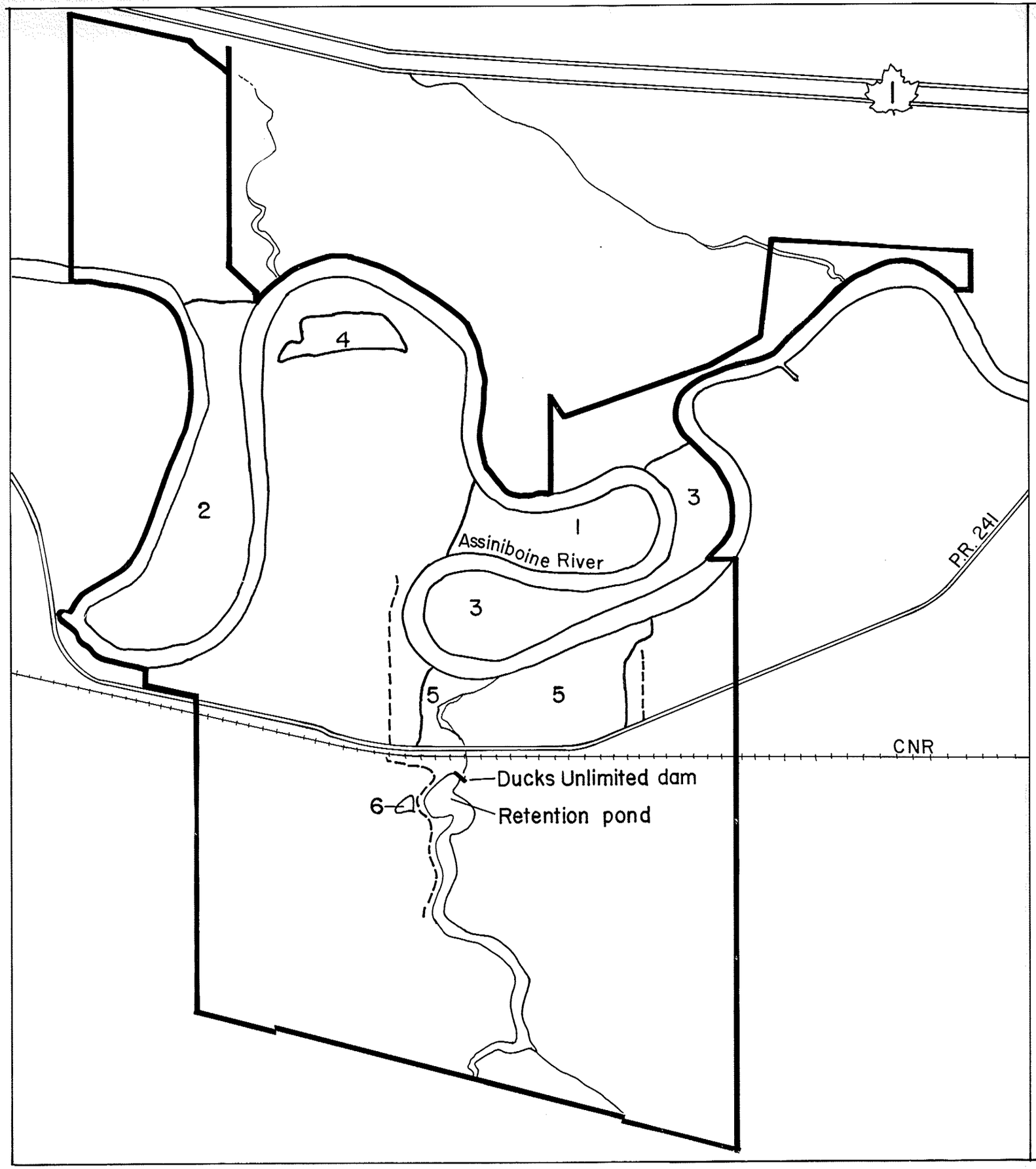
Woodland	
	Beaudry Riverbottom Forest*
	Sair Riverbottom Forest*
	Jail Riverbottom Forest
	Beaudry Aspen Forest
	Beaudry Oak Forest
Grassland	
	Retention Pond Prairie

*This indicates a Breeding-Bird Census Plot was located in the area.

MAP 3

Areas of Beaudry Provincial Park chosen for detailed inventory sampling

1 Beaudry riverbottom forest
2 Sair riverbottom forest
3 Jail riverbottom forest
4 Beaudry aspen forest
5 Beaudry oak forest
6 Retention pond prairie



Limit of Park Lands
Unpaved Roads

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metres

tory was supplemented by a review of biological studies conducted in the area previously and interviews with staff members of the Manitoba Department of Renewable Resources and Transportation Services, the Museum of Man and Nature, and Ducks Unlimited (Canada).

Objective 2: To identify and classify wildlife habitats within Beaudry Natural Provincial Park of the basis of the above wildlife study and vegetation study.

The knowledge of the natural characteristics of Beaudry Provincial Park obtained from the vegetation and wildlife inventory in combination with a review of the habitat classification and mapping systems used by Graham (1945), Alexander (1959) and others were used to develop a habitat classification system for the park. The data base obtained from the vegetation and wildlife inventory was then used to map the habitats according to the system developed.

Objective 3: To recommend management options to:

a. preserve and protect wildlife species and habitats while permitting interpretation of these resources on a year-round basis, and

b. maintain a diversity of species and habitats to permit a varied program to interpret the various habitat types and succession stages in a natural area.

Wildlife management recommendations and the objectives and guidelines or measures which could be adhered to achieve each recommendation represent a synthesis of the field data collected over the summer of 1977, a review of previous biological studies in the area, a production and use of the wildlife habitat map for Beaudry Provincial Park, a review of the principles of wildlife management and discussions with wildlife biologists. The wildlife management recommendations were also suggested as a means by which to compromise the objectives of maintenance of the Park's natural environment and provision of a wide variety of outdoor recreation opportunities inherent in the park's goal.

1.8 Structure of the Study

A brief summary of the wildlife and vegetation inventory is contained at the end of Chapter 2, however the reader is referred to Appendix D for a full presentation and discussion of these results. Details regarding the wildlife habitat classification for Beaudry Provincial Park, and the habitat map for these park lands as well as the wildlife management recommendations for Beaudry Provincial Park are also presented in Chapter 2. Chapter 3 presents the conclusions and recommendations formulated as a result of this study of the wildlife and vegetation resource of Beaudry Provincial Park.

Chapter 2

PROJECT RESULTS: WILDLIFE HABITAT CLASSICIATION SYSTEM FOR BEAUDRY PROVINCIAL PARK, WILDLIFE MANAGEMENT RECOMMENDATIONS, AND SUMMARY OF THE VEGETATION AND WILDLIFE INVENTORY

2.1 Introduction

This Chapter is a synthesis of the data obtained from the vegetation and wildlife inventory into a Wildlife Habitat Classification System and a Habitat Map for Beaudry Provincial Park, and Wildlife Management Recommendations. Together these serve as a guide for recreational development in Beaudry Natural Provincial Park. A brief summary of the vegetation and wildlife inventory and analysis, the information base from which the Habitat Classification was developed and the Wildlife Management Recommendations formulated, closes this Chapter.

2.2 Wildlife Habitat Classification System for Beaudry Provincial Park

2.2.1 Introduction

A necessary prerequisite to wildlife management is the existence of a habitat map. The habitats of Beaudry Provincial Park were classified and mapped (see Table 2 and Map 4) according to a system developed to meet the natural characteristics of Beaudry Park. This system was based upon the classification and mapping systems used by Graham (1945) and Alexander (1959).

Prior to further discussion of the habitat map, it is imperative that the definition of the term habitat is explicitly stated. The term habitat is widely used and is generally understood to mean "simply the place where an organism lives" (Odum, 1971:234). A great many definitions exist however. The definition of habitat as the typical abiotic and biotic surroundings presently capable of supporting an animal or group of animals (Duncan, 1977) provided the basis for the delineation of habitat

Table 2. Habitat Classification System for Beaudry Provincial Park

Initial Division	Type Group	Basic Type	Subtype	Successional Stage	Species
Woody Vegetation (Forests or Abandoned Land)	A. Deciduous	AA. Transition	I. Floodplain	1. Grass and Perennials	g. grass s. silverweed ss. swamp smartweed ar. arrowhead cb. common burdock
			II. Stream Edge		
			III. Inactive Streambed	2. Herbaceous	of. ostrich-fern pi. poison ivy m. moonseed rb. riverbank grape wn. wood nettle ws. wild sarsaparilla wb. wild black currant r. rose sn. snowberry
			IV. Transition Belt		
			V. Forest Opening	3. Shrubs	ga. green ash ha. hazelnut ta. trembling aspen b. basswood ae. American elm mm. Manitoba maple h. hawthorn r. rose ro. red osier dogwood w. willow
				4. Pioneer Trees	ta. trembling aspen co. cottonwood
				5. Climax Trees	ae. American elm b. basswood ga. green ash mm. Manitoba maple bo. bur oak ta. trembling aspen
		AB. Upland	I. Natural	1. Grass and Perennials	q. grass
			II. Old Field	2. Herbaceous	sn. snowberry nb. northern bedstraw da. downy arrow-wood sa. saskatoon bo.
			III. Right-of-Way	3. Shrubs	da. downy arrow-wood sa. saskatoon bo. bur oak
			IV. Forest Opening	4. Trees	bo. bur oak
Non-Woody Vegetation (Open Areas)	B.	BA. Natural	I. Prairie	1. Grass and Perennials	q. grass pw. prairie wild flowers
			II. Meadow	2. Herbaceous	sn. snowberry sa. saskatoon r. rose
				3. Shrubs	sn. snowberry sa. saskatoon
				4. Trees	ta. trembling aspen bo. bur oak
		BB. Cultivated	I. Plowed and Cropped		
			II. Hay		
		BC. Barren	I. Sand		
			II. Road		
			III. Railroad (Abandonned)		

Table 2. Habitat Classification System for Beaudry Provincial Park Continued

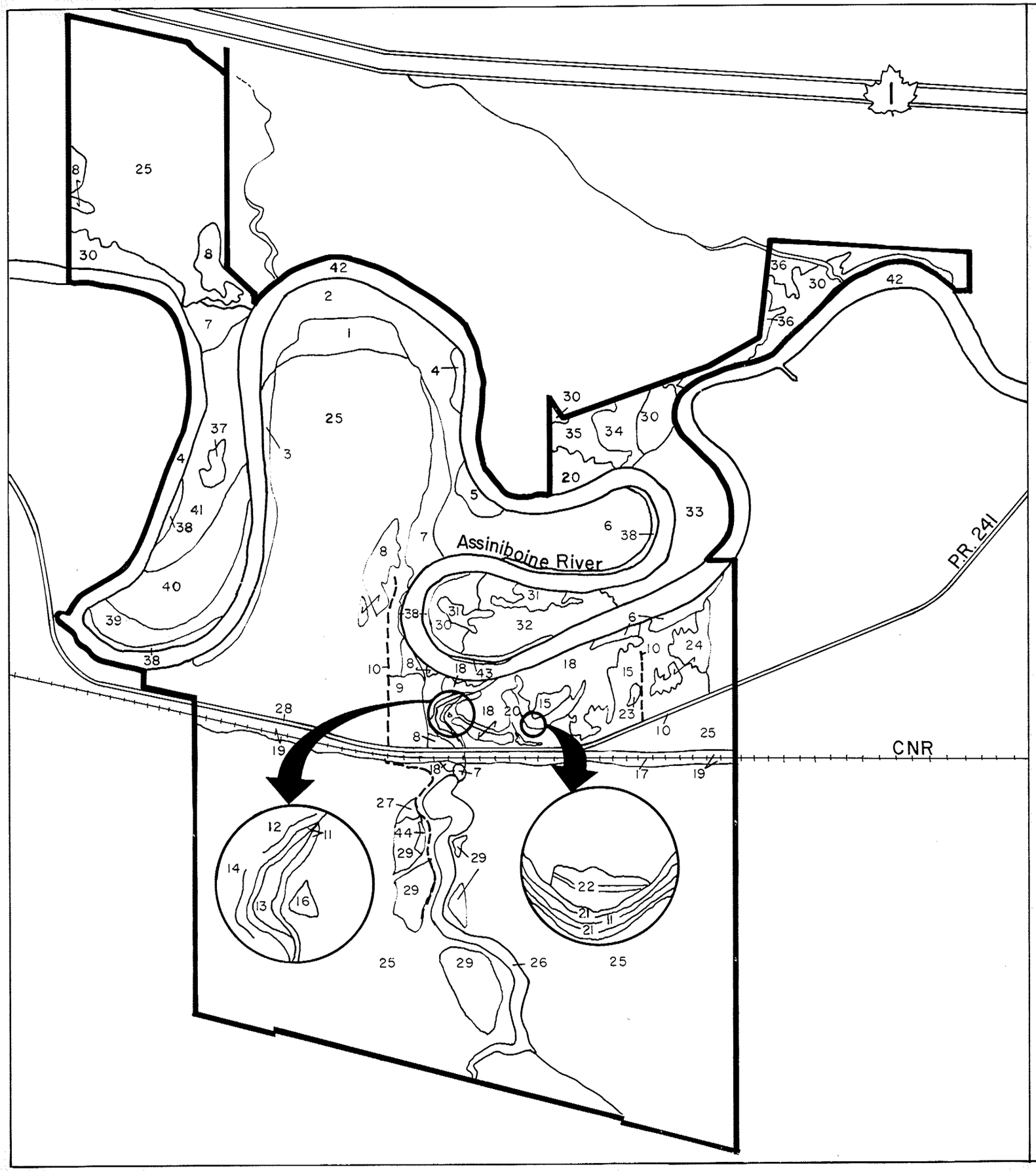
Initial Division	Type Group	Basic Type	Subtype	Successional Stage	Species
	C. Aquatic	CA. Marsh	I. Pond	1. Water	
				2. Submerged Vegetation	
				3. Emergent Vegetation	
				4. Grass and Perennials	g. grass
				5. Herbaceous	ms. meadowsweet
				6. Shrubs	sa. saskatoon ha. hazelnut
		CB. Moving Water	I. River		
			II. Stream		

Symbols to Indicate Disturbance Effects (sub-letters)

p - pastured
a - wild animal browsing
c - cleared
e - eroded
x - burned
d - disturbed

MAP 4

Habitat cover map for Beaudry Provincial Park (refer to page 19a for key)



MAP 4 LEGEND

1. AA. iv. 4. ta.
   (ha.ga.) pi. of.
2. AA. I.5. b. ae.
3. AA. iv. 5. ae. mm.
4. AA. I.5. b/co.
5. AA. I.5. b. ae.
6. AA. I.5. b. ae. ga.
   (ga.ha.) of. pi. ws.
7. AA. iv. 5. ae. o. ta.
8. AB. I. 4. bo.
9. BB. II
10. BC. II
11. *
12. **
13. CB. II
14. BA. II. 2.
    r.
15. BA. II. 1.-2.
    sn. r. - g. pw.
16. AA. IV. 4. ta.
17. BC. III
18. AB. I. 4. bo.
    (da.sa.bo.) sn. nb. da.
19. AB. III. 1.
20. BA. II.
21. AB. I. 4. bo.
22. AA. III. 3.
    r. h. ro.
23. AB. III. 3.
    sn.
24. AB. I. p. 4. bo.
25. BB. I.
26. CA. I.
27. BA. I. 1.
    g. pw.
28. AB. III. 1.
29. AB. I. 4. bo. ta.
30. AA. I. 5. ae. mm.
    (ha.ae.) of. m. pi.
31. AA. I.^{c} 1-2
    g. - r. sn.
32. AA. I. 5. b.
    (ha.ae.) of. m. pi.
33. AA. I. 5. ae. b.
34. AA. I. 5. ta. ae. mm.
35. AA. IV.^{c} 5. bo. ae. mm.
36. BB. I. - II.
37. AA. I. 4. ta.
38. AA. II. 3.
    w.
39. AA. I. 5. ae. mm.
    (ha.ga.) pi. m. wn. of.
40. AA. I. 5. ae. b.
    (ha.ga.) pi. m. wn. of)
41. AA. I. 5. b. ae. ga.
42. CB. I.
43. AA. II. 1.
    ar.
44. BA. II.^{d} 2.
    g. pw.

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*This is the shaded area, and is shown enlarged as A. It should not be shaded in the final map. Here all that is needed is a thin line eg. _____ AA.II.3. (w.)

**This is shown as enlargement B eg. _____ AA. II. 1. (s.g.) _____

Both 11. and 12. are not enlarged in the final map.

in Beaudry Provincial Park. This definition incorporates the concept of the description of the physical features of the place where an animal lives and the idea that this place (habitat) provides factors such as food, cover and water required by an animal species. Food and water provide energy and nutriment. Cover provides shelter from physical elements, escape from predators, and opportunities to express social behavior. Although the term habitat is most commonly referred to in discussions of the life requirements of a particular species, for the purposes of this study "habitat" is used in a broader sense, as an expression of the food and cover (vegetational) requirements not of a particular species but all species inhabiting or capable of surviving in that area.[1] Differences in the ability of habitats to maintain a diversity of wildlife species and the carrying capacity for each of these species are a function of variations in composition. Habitat composition varies in its complement of the number of physical attributes of the environment required for survival by animal species and those attributes that are a detriment to the species.

2.2.2 The Wildlife Habitat Classification System

It was necessary that the system chosen for the delineation of habitat occurring in Beaudry Provincial Park could present the information collected over the summer of 1977 in a concise, systematic manner and yet be flexible enough to allow for gaps in current information and the addition of new information should biological studies (specifically vegetation studies) be carried out in this park in following years. The extensive study of particular areas of Beaudry Provincial Park to the exclusion of other areas necessitated the broad delineation of habitat

[1] This definition of habitat was chosen since an attempt to delineate the habitat of all wildlife species observed during the summer, 1977 was not feasible given the time constraints for this study.

types. The classification of habitat types for Beaudry Provincial Park is given in Table 2. This classification system incorporated some aspects of the classification systems proposed by Graham (1945) and Alexander (1959) yet was designed to represent the conditions exhibited by Beaudry Park.

According to Duncan (1977) water bodies, vegetation and topography are the major environmental factors determining what areas provide the essential requirements of water, food and cover for animal life, and therefore, delineates habitat. By extrapolation then, a map which designates the aquatic/terrestrial division, vegetation and topography would give an indication of the potential distribution and abundance of any wildlife species in the area.[1]

The habitat characteristics used in describing the habitat types in Beaudry Provincial Park, corresponded to the basic requirements of all animals: food, cover and water. The parameters used in the production of the habitat map (Map 4) however, were restricted to the aquatic/terrestrial division and vegetation since topographic differences in the park were largely restricted to micro-relief.[2] Since vegetation is the most important aspect of the environment governing the distribution and abundance of bird and mammal population (ie., through the provision of cover and food) (Wecker, 1964) and since vegetation can be controlled and manipulated so as to influence animal populations (Duncan, 1977; Webb, 1942; De Vos and Mosby, 1971; Burger, 1973), the habitat map of

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[1] This map provides a basis for the evaluation of habitat or the intensive and extensive effort to estimate or appraise the value of these factors of the environment for an animal population (De Vos and Mosby, 1971).

[2] Topography is a universally applied factor in the discussion of habitat. Although topography is an insignificant environmental factor in Beaudry Provincial Park an example of its influence occurs in steep terrain where interception of insolation may strongly influence the suitability of habitats for wildlife, particularly in winter.

Beaudry Provincial Park was produced using vegetation cover description in addition to the delineation of the aquatic/terrestrial division.

The method of vegetation cover description, although modified to apply to the conditions exhibited by Beaudry Park, closely follows the ecological classification for cover types proposed by Graham (1945). Vegetation cover was divided into (1) the overstory, (2) shrub understory and (3) ground cover. Vegetation cover type symbols on the habitat map are based on ecological succession and correspond to the Habitat Classification System symbols (see Table 2). The vegetation cover type or habitat type symbols are fractions. The numerator indicates the overstory and the denominator indicates the shrub understory and ground cover. For example, applying this system the Beaudry riverbottom forest sampled in the vegetation inventory is indicated as $\frac{AA.1.5.b.ae.ga.}{(ga.ha.)\ of.pi.ws.}$ This symbol indicates this area is a transition forest (AA.), floodplain (I.) in a climax successional stage (5.) the ecological dominant trees in which are basswood (b.), American elm (ae.) and green ash (ga.); the dominant shrub species are green ash and hazelnut (ga.ha.); the dominant herbaceous species are ostrich-fern, poison ivy and wild sarsaparilla (of.pi.ws.). In general, the habitat map may be considered a synthesis of the vegetation data collected during the summer of 1977 and as a result of the limited field work carried out, may be restricted in detail.

The habitat map in conjunction with the information on the drainage, soils and topography of Beaudry Park provided in Appendix B and the delineation of areas of wildlife concentrations in the park provided in this Chapter forms the basis for wildlife management.

2.3 Wildlife and Beaudry Provincial Park

Beaudry Natural Provincial Park, an undeveloped park, provides an

excellent opportunity to apply the concept of the consideration of wildlife in the park planning process (see Appendix C). The problem in this park as in others designated as natural parks, is the preservation of the natural environment while providing for a wide range of outdoor recreation opportunities. This problem is particularly difficult in the case of Beaudry Park since its location at the fringe of the large urban community of Winnipeg is expected to result in large visitor numbers.

A survey of 4,000 households in the Winnipeg area in 1976 indicated the need for twenty-two recreation activities (Wang, personal communication, 1978). Five of the ten highest ranked recreation activities are directly or indirectly concerned with wildlife. Wildlife, therefore, can be considered as a valuable recreation resource of Beaudry Park and the management goal should be to maintain and protect the number and diversity of wildlife populations for the enjoyment of outdoor recreationists.[1] The success of management will require the provision of wildlife habitat. A prerequisite to the provision of wildlife habitat is its delineation or allocation in a formulated park plan prior to development.[2] This can be accomplished through the application of the concept of wildlife input in the planning process.

Wildlife input to the planning process requires an inventory of wildlife and vegetation in the park area and the identification of areas of wildlife concentration. Wildlife input should not end at the inventory stage (Tillmann and Monasch, 1976). An analysis which results in the provision of a set of land use planning guidelines for the parklands based

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[1] The 1976 survey indicates some demand for the provision of non-consumptive outdoor recreation opportunities.

[2] This is the least expensive method of providing wildlife habitat. Planting is the most expensive method of attracting and producing wildlife (Longrie, 1976).

upon the capacity and intensity of use tolerable by the wildlife species and their habitat should follow. In this study, such analysis is achieved by suggesting wildlife management recommendations for the park. The consideration of the strategies required to reach the state suggested by each recommendation results in the formulation of a preliminary land use plan for Beaudry Park.

2.4 Wildlife Management Recommendations

2.4.1 Introduction

The importance of the management of wildlife populations in parks as a resource for recreation through the provision and/or improvement of habitat has been identified (see Appendix C). The wildlife habitat map has been identified as the tool necessary for wildlife management in general. Its existence is particularly important where the primary method of wildlife management is "habitat management". In general, the delineation of habitat types in Beaudry Provincial Park corresponded to a delineation of vegetation types. As discussed previously, the emphasis upon vegetation results in an indication of the cover and food available to all wildlife species observed and the options available for improvement of these habitat factors through changes to the vegetation.

Wildlife management through habitat provision in a provincial park like Beaudry Park requires the determination of the wildlife species inhabiting the park, the abundance of the wildlife species, and a review of their food, water and cover needs in relation to the diversity and quality available as habitat. This overview delineates those habitat areas which should be protected and maintained as well as those which should be improved. An additional and finer outcome of this overview is its delineation of those aspects of the vegetation which could be addressed so as to maintain and/or enhance the diversity and quality of habitats available in the park.

Due to the great number of wildlife species observed in the park, the review of habitat requirements for each species and consequent formulation of management strategies for the provision of individual habitats[1] cannot be addressed within the scope and time framework for this study. Rather general management recommendations, particularly for habitat management, to maintain and/or enhance the abundance and diversity of Beaudry Park's wildlife populations will be suggested given the type of outdoor recreation opportunities most likely to be developed in the park[2] and recreationists' preferences for wildlife related activities.[3] Objectives and guidelines for the fulfillment of each recommendation were subsequently formed on the basis of a review of the park's physical features, the habitat map and the inventory.

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[1] A number of species generally reside in any broad habitat type.

[2] Nature trails, bicycle trails, cross-country ski trails, canoe routes, canoe in camping sites, group use facilities, picnic sites and interpretative facilities are likely to be provided in Beaudry Provincial Park (Wang, 1977).

[3] Knowledge of the preferences of recreationists for wildlife-related activities is essential to setting wildlife management and determining the allocation of wildlife for recreational use (Fazio and Belli, 1977). These preferences are not available for the residents of Winnipeg, i.e., those people most likely to visit Beaudry Park. Knowledge of the recreation activities demanded by these residents however, does exist (Wang, personal communication, 1978) and this data can be extrapolated. A survey in Idaho revealed participation in non-consumptive wildlife related activities. Non-consumptive Idaho users preferred to participate in the following activities (ranked): observing birds (in the field) observing small game, observing big game, observing fish, wildlife photography, painting wildlife (Fazio and Belli, 1977:120). The survey of Idaho residents also indicated the wildlife species which they preferred to watch. Among those species found in Beaudry Park, residents preferred to watch deer, bass, songbirds, waterfowl, upland birds, hawk (in order of preference). It is important to note that deer was ranked first, bass third, songbirds fourth and waterfowl fifth out of 200 wildlife categories by non-consumptive users.

By way of summary and explanation of the organization of the following section, Wildlife Management Recommendations were formulated upon the basis of the vegetation and wildlife inventory and analysis and upon the basis of preliminary determinations of the outdoor recreation opportunities likely to be provided in Beaudry Provincial Park. These wildlife recommendations are listed and then discussed individually. The discussion of each recommendation except Recommendation 1 includes a statement of the goal of wildlife management underlying the recommendation, the presentation of objectives to be reached should steps be taken to implement the recommendations, and finally general measures which could be taken to meet the objectives are presented as "Guidelines".

2.4.2 Wildlife Management Recommendations

1. Hunting of the wildlife resource of Beaudry Provincial Park should be prohibited.
2. Efforts should be undertaken to improve and/or maintain the existing wildlife habitat in Beaudry Provincial Park.
3. The inadequate habitat areas available in Beaudry Provincial Park should be improved and efforts should be undertaken to rehabilitate habitat where the potential still exists.
4. Wildlife species extirpated in the area in the recent past should be re-introduced where the appropriate habitat or potential for its provision still exists.
5. Buffer zones to wildlife habitats available in Beaudry Provincial Park and woody plantings as cover for the movement of wildlife in the parklands should be provided.
6. An Interpretative Program should be fully developed for Beaudry Provincial Park.

Recommendation 1: Hunting of the wildlife resource of Beaudry Provincial Park should be prohibited.

The goal of wildlife management in Beaudry Provincial Park is to maintain and/or enhance the abundance and diversity of wildlife species. The objectives for this park were identified in an earlier section of this study and indicate that while these park lands were acquired for recreational use, the conservation of its rich and varied natural environments is of equal importance. Further, they indicate that recreation based on interaction with the natural environment and appreciation of natural and cultural values is dominant. Given these objectives and the small population of game or furbearer species resident in the natural habitats of this park[1] consumptive outdoor recreation activities should be prohibited.

Guidelines:

1. The formulation of a policy statement by Manitoba Parks Branch which prohibits all hunting and trapping activities in Beaudry Natural Provincial Park.
2. The amendment of the Order-in-Council establishing this park to include this policy statement.

Recommendation 2: Efforts should be undertaken to improve and/or maintain the existing wildlife habitat in Beaudry Provincial Park.

The goal of wildlife management underlying this recommendation is to maintain and/or enhance the abundance and diversity of wildlife species inhabiting Beaudry Provincial Park as a resource for non-consumptive outdoor recreation. The most effective strategies to meet this goal are: (a) the application of a zoning system which delineates the type of recreation development and the amount of visitor use and (b) vegetation management.

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[1] The maximum number of beaver can be estimated as five. The total white-tailed deer population has been estimated as 25 (Shoesmith, personal communication, 1978). Only one ruffed grouse was observed during the period of field studies in 1977.

(a) Application of a Zoning System:

The basic zoning system utilized in this study is the zoning system formulated and presently in use by Manitoba Parks Branch; this zoning system is described in Criteria for the Provincial Park Lands System (1974). This zoning system has been slightly modified so as to include the consideration of visitor numbers to particular areas of the park. As a consequence, each zoning class is further divided into the subclasses of severe, moderate, slight and negligible limitation on visitor numbers to reflect the tolerance of the vegetation and wildlife populations to recreational use. A skeleton of the zoning system used in this study is given in Appendix E. The designation of the park lands into zoning classes and subclasses was accomplished through a study of the habitat map, areas of wildlife concentration, consideration of plant species' tolerance and subjective judgement based upon unquantifiable field experiences during the summer of 1977. The underlying premise of the application of a zoning system to the park was that human interaction with wildlife should be regulated since, in general, the net effect of increased interaction is a decline in wildlife populations.

(b) Vegetation Management

The broad habitats identified for protection and maintenance to ensure the continued abundance and diversity of wildlife species currently inhabiting Beaudry Provincial Park are: (i) riparian; (ii) oak/meadow and (iii) hydric river shorelines. These were identified on the basis of the vegetation and wildlife inventory and are illustrated in Map 5. In the case of all three habitats, regulation of development and visitor numbers and therefore, recreation use through the application and adherence to the zoning system comprises a large part of vegetation management.[1]

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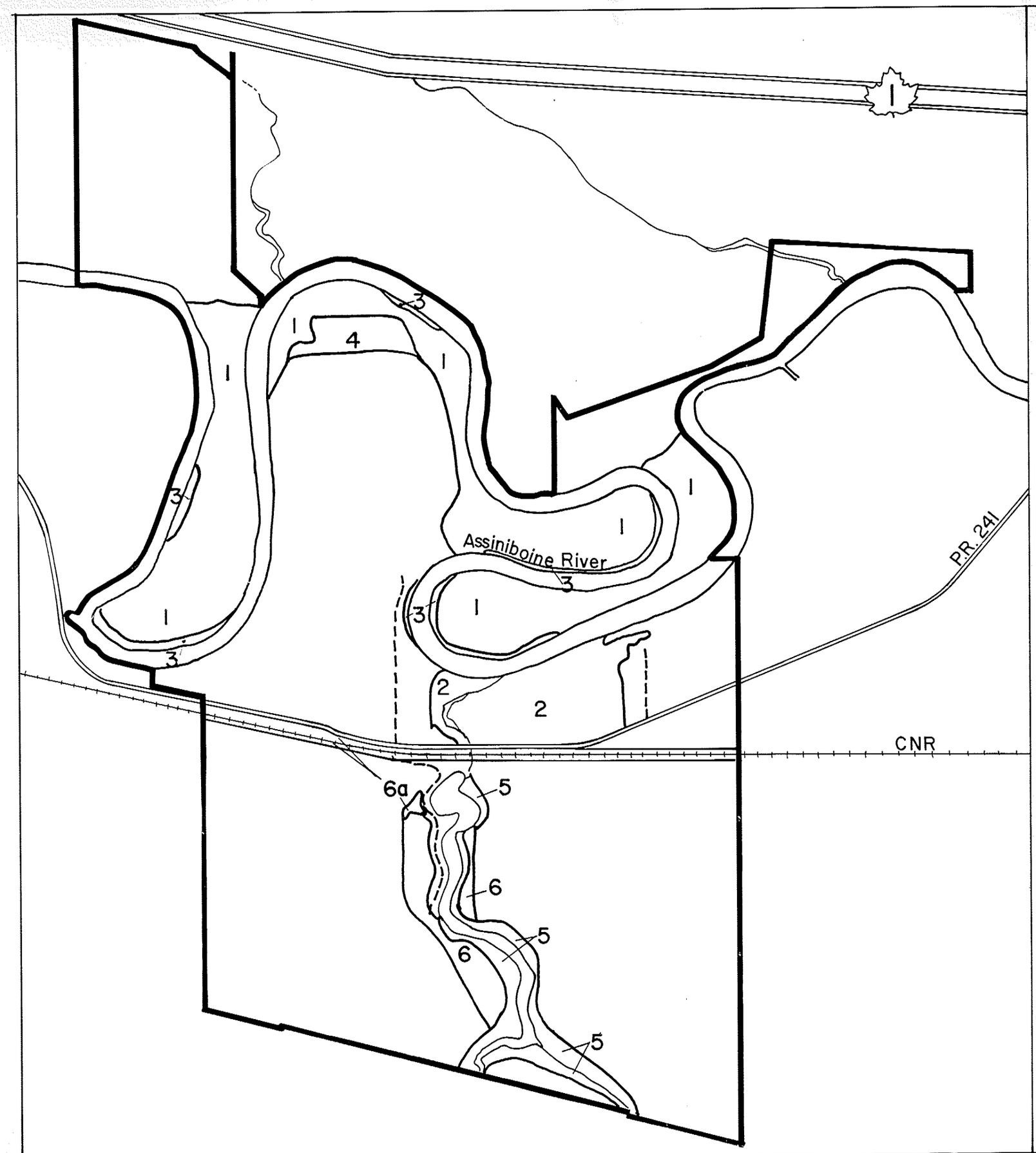
[1] Management may involve active manipulation of the plant community or protection from modification or external influences.



MAP 5

Habitats in Beaudry Provincial Park identified for wildlife habitat management

Habitats requiring protection and maintenance

1 Riparian
2 Oak / Meadow
3 Hydric river shorelines

Habitats requiring improvement

4 Aspen - Riparian
5 Wetland
6 Prairie - Aspen
6a True Prairie

Limit of Park Lands
Unpaved Roads

NORTH

0 500 1000
metres

In other words, vegetation management may be limited to protection in many instances.

(i) Riparian Habitat

The riparian habitat supports the greatest number of wildlife species of all habitats available in the park. Except for a select number of wildlife species adapted to a particular mode of life, i.e., ground squirrel or clay-coloured sparrow, the majority of the wildlife species observed in Beaudry Park either inhabit the riverbottom forests exclusively or utilize it at some point in their daily or seasonal life cycle. In addition, a number of rare species utilize this habitat; the most notable examples are the great grey owl and black-billed cuckoo. With the exception of the ruffed grouse and white-tailed deer, the wildlife species present in the riverbottom forests are primarily insectivorous or carnivorous. Although the wildlife characteristic of riverbottom forests do not depend upon plants to a great degree, plants often do compose a small, though significant portion of their diet. For example, red osier dogwood, riverbank grape and wild black currant make up a small but appreciable portion of the diet of resident songbirds and riverbank grape is favored as the plant portion in the diet of the raccoon and skunk (Martin, et al., 1951). The primary contribution of riverbottom forests as wildlife habitat can be identified as cover, shelter from weather, intrusion and predators, and an area for resting and reproductive activites. Cover needs vary according to the wildlife species and according to daily and seasonal activities. As a result, the significant alteration of part or all the existing riverbottom vegetation in Beaudry Park would prove fatal to a number of wildlife species.

Objectives for Management of the Riparian Habitat

1. To preserve and/or enhance the ecological diversity and balance of the

vegetation component of this habitat so as to maintain the food and cover available for wildlife utilization and for interpretation, and

2. To preserve the riverbottom forest identified to be of ecological significance by the International Biological Programme.

Guidelines:

1. The prohibition of developments such as dykes and dams which may alter the natural course of flooding along the Assiniboine River.
2. The preservation of the vegetation of the natural riverbottom forest located on the Beaudry peninsula through its designation as an Ecological Preserve: human access for scientific research only.
3. The protection of the existing vegetation and wildlife in the remaining riverbottom forests from recreational impacts through the application of the zoning system.
4. The protection and maintenance of important plant components: riverbank grape, ostrich-fern and immature green ash.

Riverbank grape:

The mature riverbank grape which has climbed into the upper tree canopy is a hardy plant. However, its importance as food to songbirds and some mammals and its rare occurrence in the Winnipeg area merits the protection of this species from park visitor contact. Since riverbank grape has been observed to root in the early seral stage of the riverbottom forest -- the maple/green ash dominant stands -- these areas should be protected through their classification as Class I(a). In cases where recreational development in a riverbottom

situation may destroy a riverbank grape seedling, such as the construction of a dirt trail, the seedling should be transplated to protected areas.

Ostrich-fern:

Ostrich-fern occurs in large patches throughout the river-bottom forest wherever moisture and drainage conditions meet their requirements. These plants must be protected from trampling, direct picking of "fiddleheads" and fronds (in the early spring and summer), and the indirect effect of soil compact which has been identified as a growth reducing factor (Simonson, 1976). Protection of this species could be accomplished by the restriction of recreational use in areas which support this species through the application of the zoning system and further limitation of recreation through restricting access to the area to a narrow dirt trail located so as to avoid larger patches of the fern coupled with direct warnings to visitors.

Green Ash:

Green ash has been identified as the most ecologically important tree species in the riverbottom forest of Beaudry Park (see Vegetation Inventory discussions). Green ash, averaging 30 feet in height has been observed to suffer a ninety percent mortality as a result of the compaction of soil near its roots (i.e., no damage to its bark or limbs), (Simonson, 1976). Since the majority of green ash in Beaudry Park's riverbottom forest are immature, protection from soil compaction near its roots is mandatory. This could be accomplished through the limitation of the number of recrea-

tionists in the area through zoning and the restriction of access by the construction of one narrow dirt path which avoids areas of dense green ash growth.

5. The manipulation of the disturbed vegetation in the riverbottom forests so as to achieve the natural ecological diversity and balance characteristic of the Beaudry riverbottom forest through:
   (a) the establishment of a herbaceous ground cover layer characteristic of the Beaudry riverbottom forest through:
      (i) planting ostrich-fern and riverbank grape in areas exhibiting extensive growth of moonseed hog-peanut or woods nettle,[1]
      (ii) the protection of areas containing green ash and riverbank grape seedlings, and
   (b) the preservation of the greater shrub density of hazelnut (sp.) and red osier dogwood characteristic along the river edge, and
   (c) the prohibition of "housekeeping" activities such as the removal of deadfall, tangle and dead trees and vines.
6. The protection of all rare plant species either through transplanting to a similar undisturbed habitat in the park if it were to be destroyed as a result of construction, or through the restriction of access to the plant's microhabitat (i.e., one method is to fence as protection from animals and from human plant collectors). Specific plant species which require this type of protection are nodding trillium, spotted corralroot, bittersweet and lopseed.
7. The artificial provision of nesting habitat for wood ducks,

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[1] Plants could be salvaged from areas in or outside the park which will undergo development.

through the installation of next boxes in preferred locations near the river.

(ii) Oak/Meadow Habitat

Although the wildlife diversity exhibited in this habitat is not as great as that of the riparian habitat, these vegetation cover types provide habitat requirements for a number of additional wildlife species such as the woodchuck, meadow vole, meadow jumping mouse, and the clay-coloured sparrow. The result, therefore, is increased wildlife diversity in the park as a whole. The most important reason for conservation of this habitat is that it supports a concentration of white-tailed deer. The Oak/Meadow Habitat provides an abundant supply of the white-tailed deer's preferred summer foods of grasses and forbs as well as winter foods such as snowberry and browze. This area also provides cover; during the field research, it was observed to be heavily used for bedding and calving. The presence of a stream through the area results in a readily available water supply. The stream is an important watering location, since deer were only observed to water at the river shore bordering this area when the water level in the stream was significantly reduced due to a beaver dam. A second reason for conservation of this habitat is the presence of beaver activity.

Objectives for Management of the Oak/Meadow Habitat

1. To maintain food, water and cover available for resident mammals, specifically the white-tailed deer and American beaver,
2. To maintain food and cover available for raptors, songbirds and upland birds such as the sharp-tailed grouse,
3. To maintain and protect the vegetational diversity and particularly the successional characteristics of the inactive streambed for wildlife utilization and interpretation.

Guidelines:

1. The prohibition of developments such as man-made dykes or dams which may alter the natural course of spring-run off drainage through the former streambed (inactive streambed) or the active streambed to the Assiniboine River.
2. The maintenance and protection of existing vegetation from undue impact (i.e., destruction and/or modification) as a result of recreational pursuits through the application of the zoning system,
3. The implementation of a program of restricted access to white-tailed deer concentration areas and beaver activity areas based upon the critical periods in the animal's life cycle. For example, no human access for purposes other than scientific research would be allowed in the area identified in the Oak/Meadow Habitat during the white-tailed deer calving period.[1]
4. The active management of the grassland openings in forests and in the disturbed uplands through periodic controlled burnings.

(iii) Hydric River Shorelines

This habitat area consists of fine silt and sand scrolls deposited by the Assiniboine River which supports a dense thicket of willow (Salix sp.). Herbaceous growth along the river may include swamp smartweed, arrowhead, water plantain, and alien species. Herbaceous growth in the trough neighbouring the forest is composed of horsetail (Equisetum sp.) isolated wild mint plants as well as alien plant species. This habitat area is utilized by the killdeer, the occasional waterfowl species, migrating songbirds, particularly warblers, and the beaver. Its primary functions

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1 The calving period was observed to occur during the last week in May and the first two weeks in June (1977).

in relation to wildlife are the provision of cover particularly for species which water at the Assiniboine River and the provision of a food source for the beaver.

Objectives for Management of the Hydric River Shoreline

1. To preserve the willow shoreline habitat as an integral part of the riverbottom forest community (it is the first seral stage of riverbottom forest) and for its contribution to increasing the diversity in the wildlife habitats available in Beaudry Provincial Park,
2. To maintain the food and cover available to upland birds, waterfowl, shorebirds, songbirds, beaver and raccoon,
3. To maintain the cover available to wildlife species which utilize the Assiniboine River for watering purposes.

Guidelines:

1. The prohibition of developments such as dams or dykes which may alter the natural course of river flooding and/or river flow,
2. The protection of the existing vegetation and wildlife from impact due to recreational development in Beaudry Park through the application of the zoning system and therefore, its designation as Class 1a. As a result, the removal of this vegetation for any recreational development such as a boat launch will be prohibited.
3. The restriction of access to the riverbanks of Beaudry Park through established boat launches.

Recommendation 3: The inadequate habitat areas available in Beaudry Provincial Park should be improved and efforts should be undertaken to rehabilitate habitat where the potential still exists.

The wildlife management goal underlying this recommendation is to increase the number of wildlife habitat areas in Beaudry Provincial Park capable of fulfilling the food, cover and water requirements essential

to wildlife's survival so that a possible consequence may be an increase in the diversity of wildlife species and abundance of wildlife species.

The habitat areas chosen for improvement in Beaudry Provincial Park on the basis of one summer (1977) of field observation are:

(a) aspen-riparian
(b) wetland, and
(c) prairie/aspen community

Their location is illustrated in Map 5. In most cases active manipulation of the habitat area will be required strategy if these areas are to become valuable wildlife habitat.

(a) Aspen-Riparian Habitat

Although Riparian in the geomorphological sense, this habitat's tree layer consists of trembling aspen. Even though it is not unnatural to find trembling aspen in a riverbottom situation, the ecological dominance of the river floodplain forest by trembling aspen is an unnatural condition in Beaudry Park. Trembling aspen is considered a "nurse" tree species in this location since the area was once intensively logged and since the herbaceous layer resembles that characteristic of the Beaudry riverbottom forest. This study assumes that this section of the floodplain forest will become re-established in time. Although the wildlife of this area was not intensively studied in the inventory, it is likely that this area could support the wildlife species common to the other riverbottom forests in Beaudry Park. White-tailed deer, their skeletal remains, and their trails were observed here. In addition, white-tailed deer were observed to travel across the intervening cultivated field to reach this forest. Many of the management guidelines for the riparian habitat given under Recommendation 2 apply to this riparian habitat.

Objectives for Management of the Aspen-Riparian Habitat

1. To improve the ecological diversity and balance of the tree layer of this habitat so as to re-establish this area as a riverbottom habitat characteristic for Beaudry Provincial Park and expand the area of riparian habitat available for wildlife utilization and for interpretation, and
2. To revegetate to riverbottom forest the floodplain currently under cultivation thereby to increase the area of wildlife habitat available.

Guidelines:

1. The prohibition of developments such as dykes and dams which may alter the natural course of flooding along the Assiniboine River.
2. The protection of the existing vegetation from intensive recreational development through the application of the zoning system.
3. The improvement of the tree layer by planting Manitoba maple and green ash shrubs.
4. The re-establishment of some riverbottom vegetation on the currently cultivated floodplain by
   a. Its protection from development by the application of the zoning system
   b. Plantings of basswood, green ash and American elm shrubs and trees.
5. The protection of all rare plant species either through transplantation to a similar yet undisturbed habitat in the park if the plant were to be destroyed as a result of construction, or through the restriction of access to the plant's microhabitat.

Specific plant species which require this type of protection here are nodding trillium, rattlesnake-fern, indian-pipe and lopseed.

(b) Wetland Habitat

The wetland habitat of Beaudry Provincial Park was created in 1952 through the construction of an earth fill dam by Ducks Unlimited in an existing drainage channel (Woolison, personal communication, 1978). The initial structure resulted in the creation of ten acres of marsh with 2.5 miles of shore. Continued maintenance of the dam structure resulted in the gradual increase of the area flooded to twenty acres. This habitat supports flora and fauna distinct from those of upland areas of Beaudry Provincial Park and therefore, results in the increased wildlife and habitat diversity. The vegetation of the marsh area consists of patches of cattails, sedge and cordgrass surrounded by shrubs such as meadow-sweet, Saskatoon, and rose. The number of waterfowl and shorebird species observed in this area during the spring/summer/fall of 1977 were very few. A review of past correspondences regarding this area reveal that this area was once heavily used by waterfowl during the spring and fall migration and that shorebirds such as the great blue heron resided in the area.[1] It is suspected that the current water level in the marsh is too high for intensive waterfowl use. The designation of this area as a retention pond rather than a marsh is therefore, appropriate. This area does have great potential as a waterfowl production and staging area through adjustment of the water level and active vegetation manipulation. A number of mammal species were noted to utilize the retention pond (white-tailed deer, raccoon, beaver), however the intensity of use here

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1 A concentration of great blue herons were observed a few years ago and led to speculations that a rookery existed (Woolison, personal communication, 1978).

seemed much less than use by these species in other habitat areas of Beaudry Park.

Objectives for Management of the Wetland Habitat

1. To increase waterfowl production and staging through the improvement in food, cover and water level,
2. To increase the diversity and abundance of wildlife species particularly shorebirds, beaver and muskrat utilizing this area through the improvement of food and cover,
3. To protect, and where necessary nuture, the plants characteristic of the wetland and the seral stages which naturally occur as a marsh fills in but which are evident in the rise from lowland to upland for use in interpretation of the area, and
4. To increase the diversity and abundance of wildlife species utilizing the area in general so as to improve the interpretative potential of the area.

Guidelines:

1. The initiation and completion of a survey of existing vegetation surrounding the retention pond through transects and the determination of water quality, soil, and water flow into the pond in the spring prior to specific action regarding the following guidelines.
2. The modification of the existing dam structure to a variable dam which allows for the control of the water level in the pond or the construction of one or two controllable culverts which can be used to modify the water level in the pond.
3. The improvement of the food and cover available by planting reeds (Phragmites communis), sedge (Carex sp.) and bulrush

(Scirpus sp.) as well as swamp smartweed (Polygonum sp.) pondweeds (Potamogeton sp.) and water milfoil (Myriophyllum sp.)[1]

4. The establishment and maintenance of an equal acreage (20 acres) of lure crops (barley) adjacent to the retention pond.

5. The establishment and maintenance of upland habitat through the planting of a mixture of sweet clover, alfalfa and tall wheatgrass. Maintenance may require periodic burning or mowing to curtain succession to grass.

NOTE: An alternative to the conversion of the retention pond to a marsh would be the development of a marsh area to the east of the pond and retain the pond for canoeing and fish management.

(c) Tall Grass Prairie/Aspen Community Habitat

According to the map of the distribution of grassland and forest types in the southern Great Plains of Canada prior to settlement compiled by Watts (1969:94) Beaudry Provincial Park occurs at the boundary of the True Prairie and aspen-oak grove. Since only relic areas of the True Prairie and aspen-oak grove are present in Beaudry Park and the prairie species are characteristic of each, these are treated as one habitat. According to descriptions of these vegetation types by Watts (1969) the vegetation consists of small tree groves of bur oak and aspen widely scattered across an expanse of tall grass prairie. In drier sites such as crests of ravines and steep river slopes bur oak dominates in the groves. The cultivated land (see Map 4) probably exhibited this vegetation type. Wildlife species which once dominated this community were the bison, prong-horned antelope, and elk (Bird, 1961). The thirteen-lined ground squirrel, Richard's ground squirrel, pocket gopher and white-

[1] The strategy is feasible in only those areas with a water level less than three feet.

tailed jack rabbit were abundant in the grassland (Bird, 1961). Other mammals inhabiting the area were the meadow vole, red fox, badger and weasels. Characteristic birds of the grassland were the western meadowlark, horned lark, upland plover, chestnut-collared longspur. The sharp-tailed grouse, clay-coloured sparrow, chipping sparrow and vesper sparrow were abundant in the grassland adjacent to woodland (Bird, 1961). Raptors such as the red-tailed hawk, Swainson's hawk, ferriginous hawk, marsh hawk and short-eared owl also utilized this habitat type (Bird, 1961). The expansion of this habitat type in Beaudry Provincial Park would greatly enhance the park's current endowment of wildlife habitat.

Objectives for Management of the Tall Grass Prairie/Aspen Community Habitat

1. To improve food and cover available for upland birds such as sharp-tailed grouse, ruffed grouse, songbirds and raptors.
2. To extend the area and type of habitat available for white-tailed deer through the provision of oak and aspen bluffs, and
3. To expand the area of native tall grass prairie for wildlife and interpretative use.

Guidelines:

1. The delineation of existing relic areas of tall grass prairie and their protection from recreational or other development impacts through application of the zoning system.
2. The restoration of a significant portion of the remaining area as prairie through direct planting of native grass and forb species.[1] The maintenance of the restored prairie, once established, through periodic burning.
3. The establishment and maintenance of bluffs consisting of bur

[1] Only native species should be planted such that the regulations of the Noxious Weed Act of Manitoba are enforced.

oak and trembling aspen through planting. The bluffs located in drier sites would be dominated by bur oak. The bluffs in wetter sites would be dominated by trembling aspen. Attempts should be made to transplant the ground layer species characteristic of aspen-oak bluffs to these artificial bluffs.

Recommendation 4: Wildlife species extirpated in the area in the recent past should be re-introduced where the appropriate habitat or potential for its provision still exists.

The goal of wildlife management in Beaudry Provincial Park underlying this recommendation is to increase the wildlife diversity in the park lands and thus provide an enhanced wildlife resource for use in non-consumptive outdoor recreation, particularly interpretation.

Objective for Recommendation 4:

To re-introduce the sharp-tailed grouse in the Prairie/Aspen Community Habitat and the ruffed grouse[1] and the American porcupine in the riparian habitat.

Guideline:

The establishment of a scientific study of food habits and food available in the habitat areas identified for potential re-introduction for each associated wildlife species. The aim of this scientific research would be to determine the feasibility of re-introduction given the existing food and cover availability, habitat improvement strategies such as modification to the existing vegetation to provide for preferred foods or to meet special habitat requirements such as sharp-tailed grouse dancing grounds, which would improve the success of re-introduction, and the number of each species which the habitat could theoretically support. This research should also address

[1] Since the observation of ruffed grouse was limited to one individual this species was considered extirpated for re-introduction purposes.

the issue of species control. For example, the introduction of ruffed grouse without consumptive recreational use of this species or sufficient protection of its predators in Beaudry Provincial Park could lead to a population explosion and collapse.

Recommendation 5: Buffer zones to wildlife habitats available in Beaudry Provincial Park and woody plantings as cover for the movement of wildlife in the parklands should be provided.

The wildlife management goal underlying this recommendation is to maintain the abundance and diversity of Beaudry Park's wildlife species through protection from the quantities of human interaction which could prove intolerable and to increase the quality of wildlife habitats available. Without adequate buffer zones increased contact between wildlife and recreationists would occur. Although some wildlife species are particularly tolerant of human contact and in fact, thrive under such a situation, a number of species could not tolerate the increased interaction and would retreat further inland in the same habitat area. Where additional habitat providing similar food and cover or special species requirements is in short supply, retreat would prove fatal.

Objectives for Recommendation 5:

1. To provide a buffer zone to wildlife habitats.[1]
2. To provide habitat cover which enables the travel of wildlife species from one habitat to another as its habitat requirements change with the seasons, and
3. To provide an opportunity to view some of the wildlife species characteristic of Beaudry Park.[1]

Guidelines:

1. The provision of buffer zones to wildlife habitat areas by:

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[1] In many cases the buffer zone and woody plantings may be valuable wildlife habitats due to "edge" effects. "Edges" exhibit a great variety of wildlife species. In this case it is assumed that the wildlife species would be tolerant of human contact.

(a) the application of the zoning system, and

(b) active vegetation management such as the planting of trees and shrubs with high wildlife value such as heavy seed, berry and fruit-producing species native to the neighbouring habitat area.

2. The development of as much "edge" effect as possible where natural areas meet recreation areas through the planting of a diversity of trees, shrubs and herbs native to the adjacent habitat area in an irregular pattern.

3. The provision of woody cover in order to facilitate the movement of wildlife species between habitat areas. This will require a study to determine wildlife movement routes in Beaudry Park and the cover requirements of the travelling wildlife species given the recreational use of the areas traversed.

4. The maintenance of undisturbed buffer strips of vegetation along the Assiniboine River's banks so as to provide shade and insect food for fish, dens for aquatic mammals, cover for migrating songbirds, and to stabilize the riverbanks.

Recommendation 6: <u>An Interpretative Program should be fully developed for Beaudry Provincial Park.</u>

The goal underlying this recommendation is the protection of the wildlife species and their habitats from excessive human interference. In Manitoba's Provincial Parks System, interpretation is one service for the park visitor. The definitions of Interpretation abound; one definition which offers a summary of the interpretative task is:

> "The process of developing a visitor's interest in and enjoyment and understanding of an area, by describing and explaining its characteristics and their inter-relationships." (Sharpe, 1976:4).

The objective of Interpretation for the purpose of this study is to accomplish management goals through:

a. Its encouragement of the thoughtful use of the recreation resource by the visitor by reinforcing the idea that parks are special places requiring special behavior, and

b. Minimizing human impact on the resource by guiding people away from fragile or overused areas (Sharpe, 1976).[1]

Guideline:

The development of a comprehensive Interpretative Plan for Beaudry Provincial Park.

This plan should allow for maximum viewing possibilities while providing for minimum disturbance of wildlife species and their habitat. This could be accomplished through careful location of such facilities as viewing towers and an Interpretative Centre as well as full use of the Interpretative media (for example, slide shows and 16 mm film). Floral and faunal features which should be included in an Interpretative Program for Beaudry Provincial Park are listed in Appendix F.

Conclusion drawn from Recommendations:

The result of the presentation of the Wildlife Habitat Recommendations and discussion of measures to reach the objectives for each Recommendation is the delineation of land-use zones for Beaudry Provincial Park. These land-use zones reflect the tolerance of the natural vegetation and wildlife to recreational use and present a guide to the areas most suitable for recreational development in the Park. (See previous discussions and Map 6).

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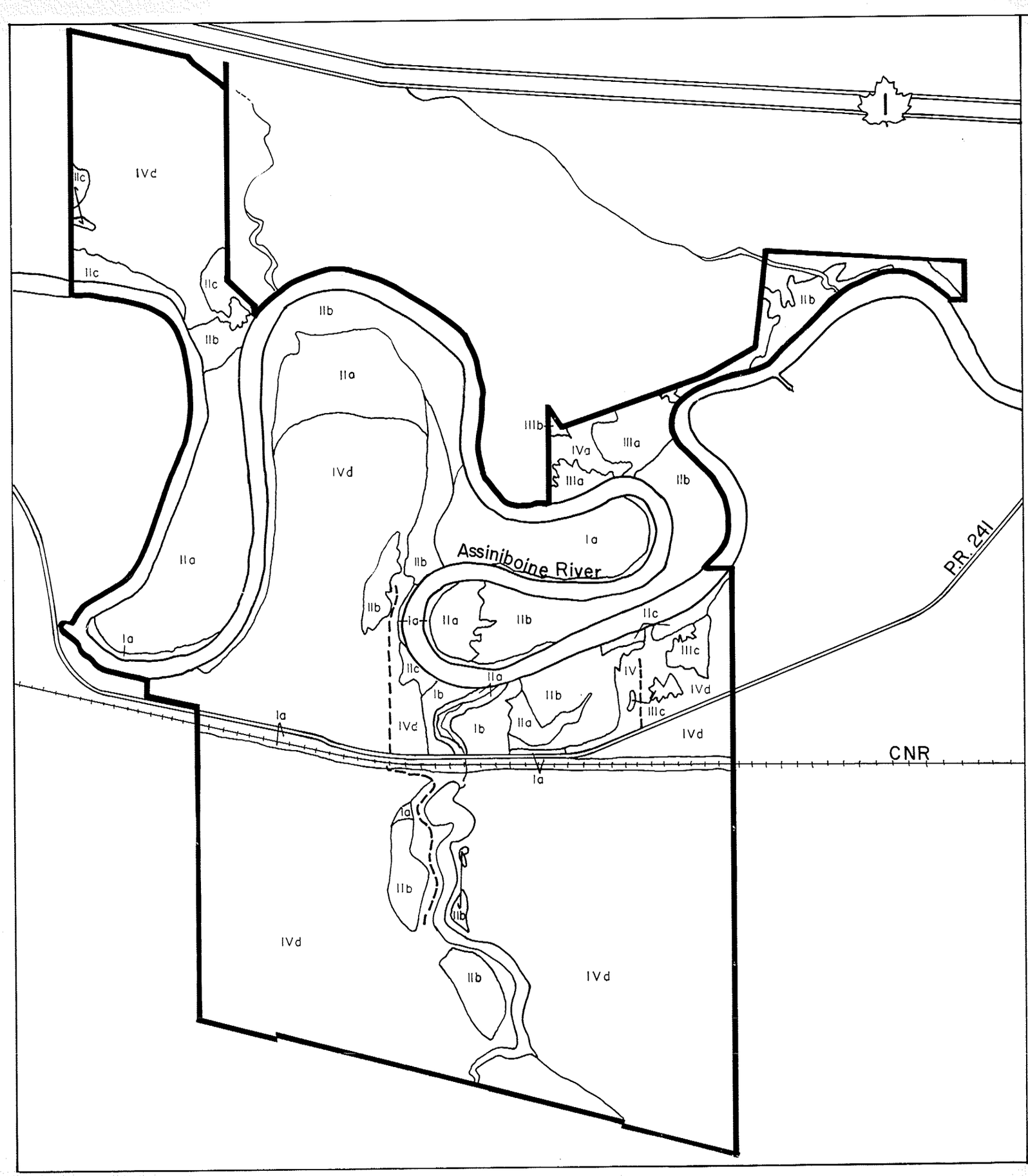
[1] The remaining two objectives which Interpretation seeks to achieve are:

1. To assist the visitor in developing a keener awareness, appreciation and understanding of the area he or she is visiting, and
2. To promote public understanding of an agency and its programs. (Sharpe, 1976).



MAP 6

Land use zones for Beaudry Provincial Park reflecting the tolerance of the natural vegetation and wildlife populations to recreational use

LAND USE ZONES
Class I. Special areas
Class II. Primitive environment areas
Class III. General outdoor recreation areas
Class IV. Intensive use areas

Tolerance To Recreational Use By The Natural Vegetation and Wild-Life Populations
a. Negligible
b. Slight
c. Moderate
d. Severe

Limit of Park Lands
Unpaved Roads

NORTH

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metres

2.5 Supporting Information: the Vegetation and Wildlife Inventory Results

2.5.1 Vegetation:[1] Introduction

The vegetation types and their location in Beaudry Provincial Park were delineated[2] (see Map 7), to provide a general description of the vegetation present in the park and also to give an indication of their distribution. However, since a description of vegetation demanded in an inventory is more effectively accomplished through the presentation of the structure and floristic composition (Kuchler, 1974), intensive vegetation study was deemed necessary.

Woodland

In the forested areas chosen for intensive vegetation study (see Table 1), the vegetation cover corresponded to three layers: tree, shrub and herb.[3] Sampling and the continuous record of species observed throughout the summer of 1977 provided the data leading to the description of each of the three forest layers in the areas sampled by floristic composition and dominance of species (one or more species). Dominance is measured by importance value. The concept of Importance Value (IV) has been used extensively as a means of assessing the biological contribution of species to the forest community since its formulation by Curtis and McIntosh (1951) (Skeen, 1973:655).

In the tree strata, a species IV was the sum of (1) the species' relative dominance or percent basal area coverage relative to other species in the stand; (2) relative density or percent occurrence per area

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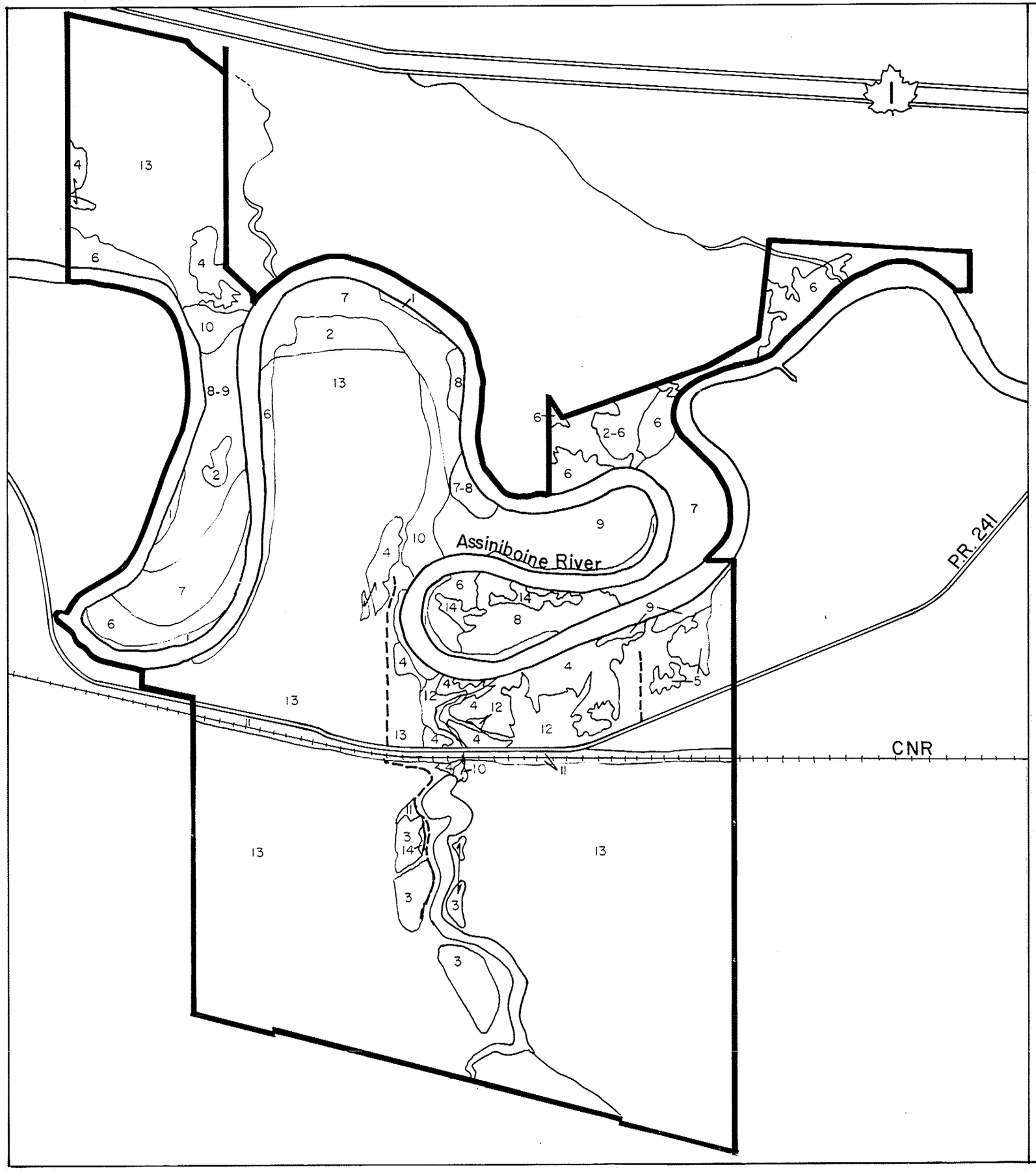
[1] A plant species list for Beaudry Provincial Park is provided in Appendix G.

[2] A description of the method used to delineate the vegetation types is included in Appendix H.

[3] The sampling procedure followed is provided in Appendix H. In general, the procedure was a modified adaption of the quadrat sampling method outlined by James and Shugart (1970).

MAP 7

The vegetation of Beaudry Provincial Park



1 Willow
2 Aspen
3 Oak-Aspen
4 Oak
5 Disturbed Oak
6 Elm-Maple
7 Elm-Basswood
8 Basswood
9 Basswood-elm-ash
10 Riverbottom transition
11 Prairie
12 Disturbed Prairie
13 Cultivated Field
14 Disturbed Ground

Limit of Park Lands
Unpaved Roads

NORTH

100 0 500 1000
metres

sampled relative to other species; and (3) relative frequency or percent probability of occurrence in the total sample area relative to other community species.[1] In the shrub strata, a species' IV was the sum of (1) the species' relative density or percent occurrence per area sampled relative to other species and (2) relative frequency or percent probability of occurrence in the total sample area relative to other species. In the herb layer, the relative cover value or percent mean cover value relative to other species is the measure for Importance Value. The Braun-Blanquet cover-abundance scale was used to assign a cover value for the species sampled and as the method of vegetation description in the herbaceous layer[2] since the determination of the density of individuals is extremely tedious and time consuming. Cover is an estimate of the area of coverage of the foliage of the species in a vertical projection on to the ground and the cover value (given in the scale[3]) assigned to a species reflects its importance or dominance (Shimwell, 1971).

Grassland

Only one area in Beaudry Provincial Park belonging to this broad vegetation division was chosen for vegetation study. This area, indicated in Map 3, was chosen since it is the least disturbed and largest area of the prairie vegetation type present in the park. The objective of a vegetation inventory here was to describe the flora of this area irrespective of the numerical abundance of each species. As a result, the procedure[4] followed differs radically from the procedure employed to

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1 The maximum value for any parameter for any species is 100%; the importance value of a species may range from 0 to 300.

2 The Braun-Blanquet cover-abundance scale and the method used to sample the herbaceous forest layer is given in Appendix H.

3 See footnote 2.

4 The sampling method followed is provided in Appendix H.

study woodland areas. Periodic surveys of the area provided the data leading to compilation of a phenological record in the form of the flowering dates of the major forbs present for this area. This data is included in a Flowering List for the major plants in Beaudry Park (see Appendix I).

2.5.2 The Results of the Vegetation Inventory: Woodland Composition and Structure

2.5.2.1 Riverbottom Vegetation Type

Tree Strata

Intensive sampling in the three areas of riverbottom forest in Beaudry Provincial Park chosen for study indicated that green ash was the most important or ecologically dominant tree species. Basswood, American elm, Manitoba maple, bur oak, and cottonwood follow in importance respectively in the riverbottom vegetation community type as a whole.

In general, the tree species characteristic of this vegetation type are adapted to moist soils, and the distribution of species can be related to the moisture regime. In areas of wet soils, such as areas of a high water table and those subject to spring inundation, Manitoba maple and green ash compose the canopy layer. In areas with less soil moisture due to their position one to two feet above the river level, (Simonson, 1976) American elm forms the upper canopy layer and green ash and Manitoba maple form the understory, basswood and bur oak are also occasional members of the canopy. In areas with progressively drier soils due to their position eight feet above the river's summer level (Simonson, 1976), Basswood forms the canopy and green ash is the dominant tree species of the understory. American elm and bur oak attain a sub-dominant position in the canopy. Where the moisture regime does not follow a gradient, as is the case for the Beaudry riverbottom forest, American elm, basswood, Manitoba maple and green ash may all intergrade. Subtle distribution patterns may occur however. For example, green ash would occur in greater numbers

in low lying area, i.e., meander troughs.

The preceeding discussion has given some indication of the general composition and structure of Beaudry Park's riverbottom forest. Since land use in each of the areas of riverbottom forest sampled in Beaudry Park varied in the past the tree strata of each will be discussed separately.

In the Beaudry riverbottom forest as in the riverbottom community type, green ash is the most important or ecologically dominant tree species. It is followed by basswood and American elm which attained an equal importance value, then by Manitoba maple, bur oak, and cottonwood.

In the Sair riverbottom forest, both green ash and American elm are ecological dominants. Basswood, Manitoba maple, bur oak, and cottonwood follow in ecological importance. The most significant difference between the Beaudry and Sair riverbottom forests is the increase in the number of elm from that found in the Beaudry riverbottom forest. An indication that American elm will continue to be more ecologically dominant than basswood in the Sair riverbottom forest is the fact that the greatest increase in elm trees was found in the lowest diameter size class.

In contrast to the Beaudry and Sair riverbottom forests, basswood is the ecologically dominant tree species in the Jail riverbottom forest. Basswood is followed in importance by green ash, Manitoba maple, American elm, cottonwood and bur oak.

Shrub Strata

A total of sixteen shrub species were sampled in the riverbottom vegetation type. Of the sixteen shrub species (Riverbank grape, Moonseed, and Bittersweet) are woody lianas and two species (trembling aspen, Saskatoon) are considered foreign to a riverbottom forest shrub strata. Hazelnut and green ash combine as the most dominant shrub species in the riverbottom forests studied with the exception of the Jail forest where

green ash and American elm are the dominant shrub species. Green ash is widely distribution in the Beaudry and Sair forests (although more so in the Beaudry forest). Hazelnut is found to occur in thickets in areas of disturbance or in areas bordering the river's edge (usually on the cut-off bank). Beaudry riverbottom forest exhibits the greatest number of shrub stems per hectare, diversity in shrub species, and compliment of lianas.

Groundcover Strata

A total of forty-seven species were found to occur in the ground layer of the riverbottom forests of Beaudry Park sampled. Ten of these species are considered foreign[1] to a riverbottom forest. Beaudry riverbottom forest exhibited thirty-four species, Sair riverbottom forest exhibited thirty species and Jail riverbottom forest exhibited thirty-nine species. Beaudry forest exhibits the most diverse complement of ground cover species characteristic of a riverbottom forest. The Jail riverbottom forest exhibits the lowest such diversity since the natural vegetation was greatly disturbed. The most profound differences in the three forests' ground cover occurs in the species which together are the most dominant species of the groundcover. In Beaudry the dominants are ostrich-fern, poison ivy, and sarsaparilla; in the Sair forest the dominants are poison ivy, moonseed, woods nettle and ostrich-fern; and in the Jail forest the dominants are ostrich-fern, moonseed, and poison ivy. Although ostrich-fern is important in all forests, the importance of poison ivy and wild sarsaparilla vary. In the Jail forest the importance of poison ivy is considerably lower than is the case for the Beaudry and Sair forests. In the Jail and Sair forest, moonseed attains a high importance

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[1] Canada anenome, snowberry, common burdock, goldenrod, spiny-leaved sow thistle, Canada thistle, rose, hedge bindweed, stickseed, red raspberry and chokecherry.

position in comparison to its secondary importance in the Beaudry forest. In addition, woods nettle is one of the dominant ground cover species in the Sair forest whereas this species is of low importance in the Jail forest and not of significant importance in the Beaudry forest as a result of its infrequent occurrence.

A feature of the ground cover of the riverbottom vegetation type present in Beaudry Provincial Park is the prominant role played by the fern, lily, moonseed, cashew and vine families in the forest strata. In addition, the high content of lianas is worthy of note.

2.5.2.2 Beaudry Aspen Vegetation Type

The data compiled from extensive sampling of the Beaudry aspen forest indicates that trembling aspen attains the highest importance value and therefore, is the ecological dominant tree species in this forest. Green ash, Manitoba maple, American elm, and bur oak follow in importance respectively.

Trembling aspen also attains the highest importance value in this forests' shrub strata. Hazelnut and green ash follow in importance respectively.

A total of thirty-five species were sampled in the groundcover strata of Beaudry aspen forest yet only twenty-two species exhibited cover values great enough to calculate the relative cover values. Ostrich-fern and poison ivy are the most important species in the groundcover. Wild sarsaparilla, wild black currant, green ash, trembling aspen, and wild lily-of-the-valley also contribute significantly.

2.5.2.3 Oak Vegetation Type

The data compiled from extensive sampling of the Beaudry Oak Forest indicates that bur oak is the ecologically dominant tree species of this vegetation type. The only other tree species sampled was green

ash. This species occurred in only one of the thirteen sample plots and its importance value is of relative insignificance. The dominant species in the shrub strata of this forest is downy arrow-wood. Saskatoon, bur oak, hawthorn, green ash, and chokecherry follow in importance respectively.

Forty-two species were sampled in the groundcover strata of this forest, however thirteen of these species exhibited very low average cover values in the few sample plots in which they did occur and therefore, did not attain a statistically significant importance value. Snowberry is the most important herb species. Northern bedstraw, downy arrow-wood, Saskatoon, grasses, and rose followed in ecological importance respectively. The remaining herb species attained a low importance value and are indicated in Appendix D.

2.5.3 Wildlife

2.5.3.1 Introduction

The methodology employed in the inventory of the fauna of Beaudry Provincial Park was much less rigorous than that followed for the vegetation inventory. As was the case for the vegetation inventory, wildlife sampling was concentrated in the general areas of Beaudry Park chosen for more intensive study listed in Table 1. Wildlife sampling techniques employed were restricted to small mammal trapping in eight locations listed in Table 25, Appendix H and a Breeding-Bird Census in the Sair and Beaudry riverbottom forests. The data obtained from the sampling techniques was supplemented with the continuous record of the species and location of the fauna[1] observed during the summer of field work (1977).

The specific methodology employed in the Breeding-Bird Census and small mammal trapping plus a summary version of the raw data collected is

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[1] Those faunal species not commonly seen from day to day were recorded, i.e., a record of species commonly seen such as the Mourning Dove, Blue Jay, Richardson's Ground Squirrel, etc. were not kept.

included in Appendix H and I. The supplemental record of the species and location of fauna observed is also given in Appendix I.

As indicated in the species lists (Appendix G) a large variety of fauna have been observed in Beaudry Provincial Park.

2.5.3.2 Birds

Ninety-five species of birds were observed within Beaudry Provincial Park in the summer of 1977 (see Appendix G). Summer resident and migrant bird species constitute the majority of species which may occur within Beaudry Park. This diversity of bird species is a direct result of the food and cover requirements available in the diversity of habitats present in Beaudry Provincial Park.

Breeding-Bird Censuses conducted in the Beaudry riverbottom forest and the Sair riverbottom forest indicated that the most abundant bird species were songbirds: Least Flycatcher, Red-eyed Vireo, American Robin, Rose-breasted Grosbeak, and Warbling Vireo. These species were most abundant in the first two-thirds of the Beaudry and Sair peninsulas and in the lands bordering the river (within 100 m. to 250 m. of the river's bank).

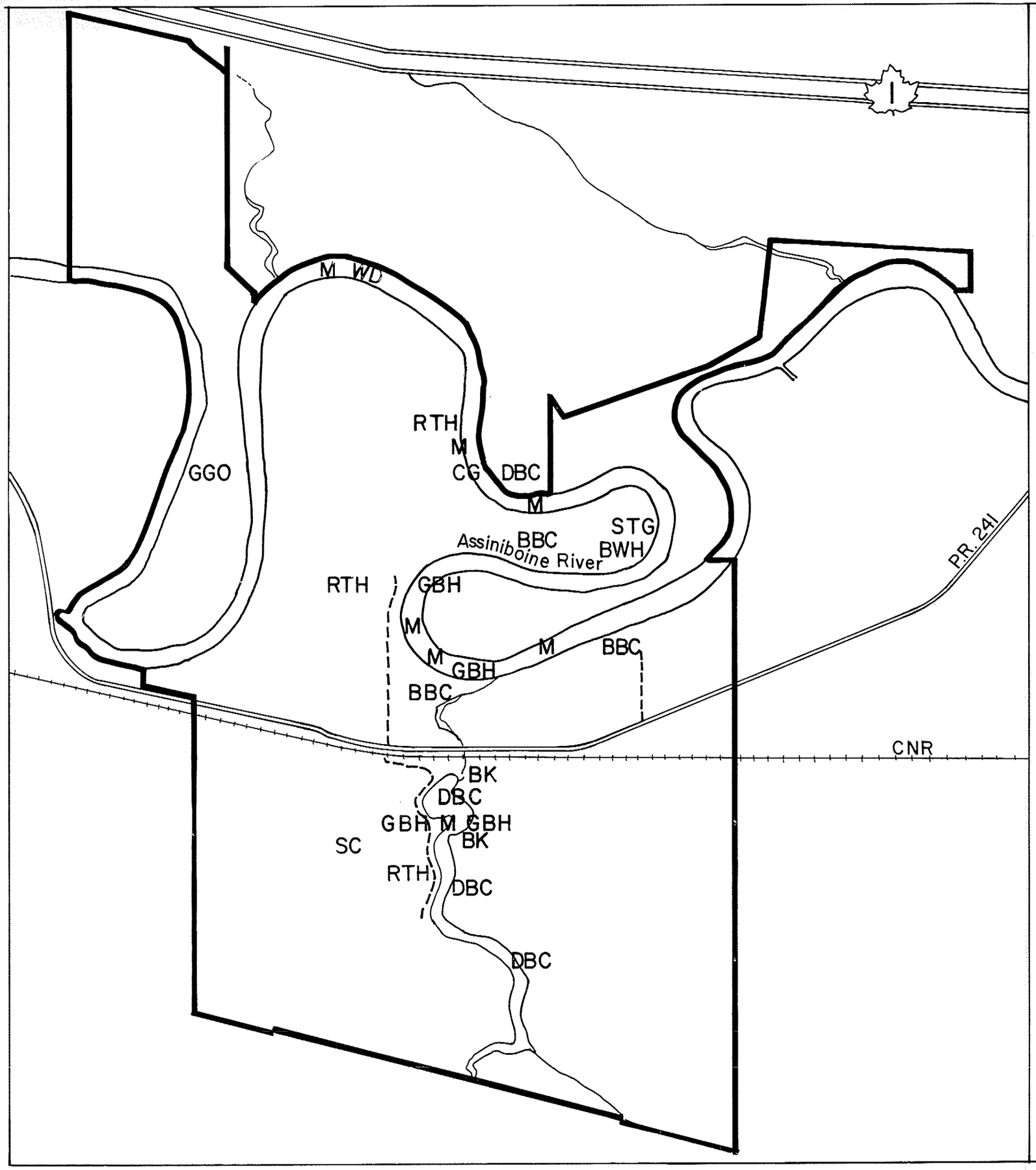
The continuous record of bird species sighted and the location observed during the summer of 1977 (see Appendix D) was translated into a map showing the areas preferred by particular species (see Map 8). In general, bird species were most abundant and most commonly observed in the ecotone between forest and grassland (edge habitat), the forested areas bordering the Assiniboine River, willow thickets bordering the river, the active stream and at the site of the inactive streambed, and clumps of shrubs and trees scattered throughout some open areas.

These generalizations in combination with Map 7 provided a data base for decisions regarding management policies for these and neighbouring

MAP 8

Areas in Beaudry Provincial Park preferred by some bird species observed, Summer 1977

DBC	Double-Crested Cormorant
GBH	Great Blue Heron
CG	Canada Goose
M	Mallard
WD	Wood Duck
RTH	Red-Tailed HawK
BWH	Broad-Winged Hawk
STG	Sharp-Tailed Grouse
SC	Sandhill Crane
GGO	Great Gray Owl
BK	Belted Kingfisher
BBC	Black-Billed Cuckoo



Limit of Park Lands

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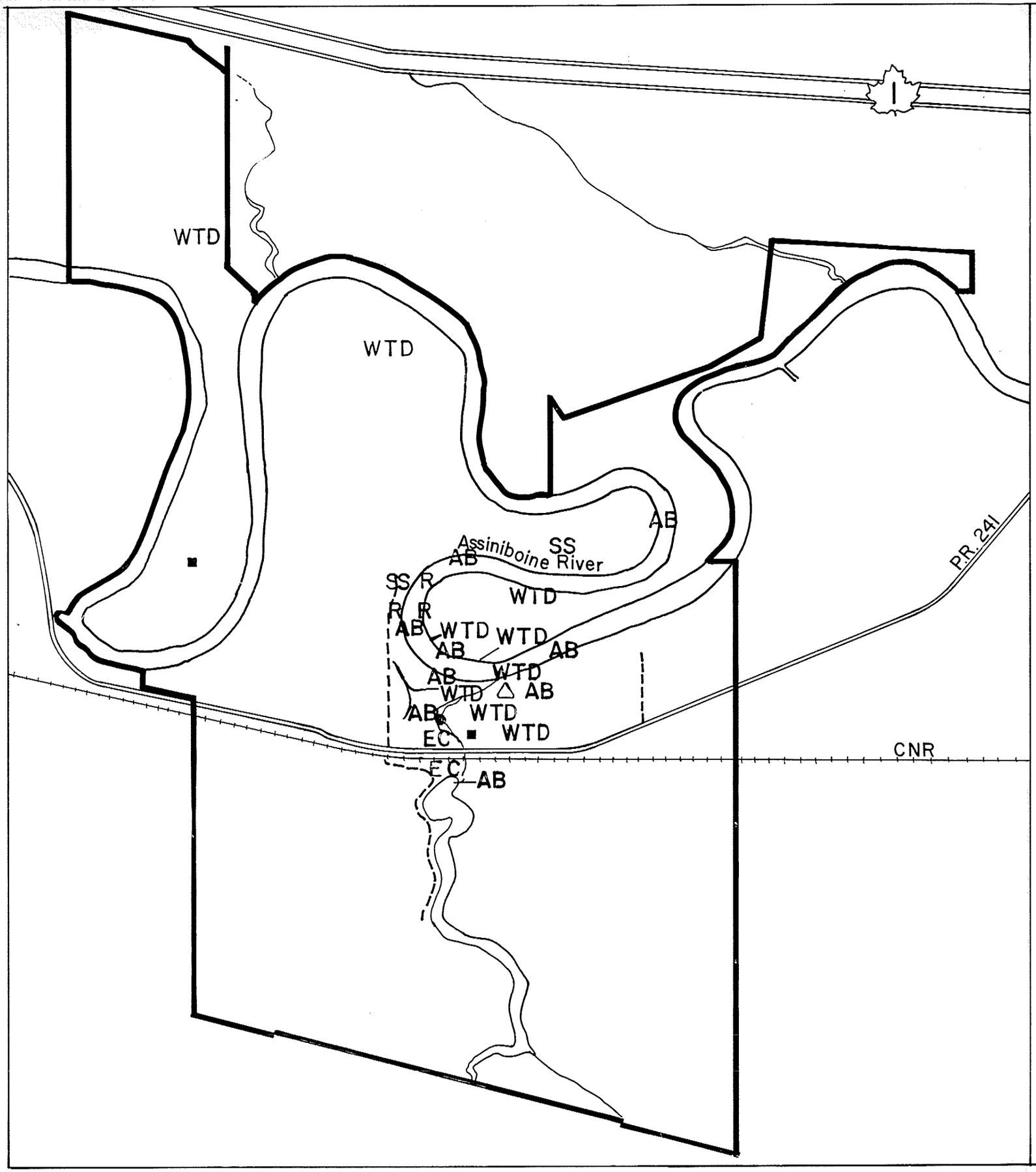
areas of the park and gave some indication of the type of recreational development (preservation, limited recreational use, intensive recreational use, etc.) suitable for these areas.

2.5.3.3 Mammals

Nineteen species of mammals were recorded within Beaudry Provincial Park in the summer of 1977 (see Appendix G). Terrestrial mammals commonly observed in the summer included the White-Tailed Deer, Eastern Chipmunk, Richardson's Ground Squirrel, Thirteen-lined Ground Squirrel, Grey Squirrel, American Red Squirrel and Raccoon. The Eastern Cottontail, Woodchuck, Northern Flying Squirrel, Red Fox and Striped Skunk were seen infequently most likely because of their lower population density in the park and/or their elusive nature. Small mammals were found to be abundant in Beaudry Park. Beaver and Muskrat, aquatic mammals, were also observed. Beavers were commonly sighted as were signs of their activity: dam, scent mound, trail and feed cuttings.

Small mammal trapping provided an indication of the species of small mammals present in the various vegetation types of Beaudry Provincial Park. A discussion of the small mammal trapping program and results is given in Appendix D. The continuous record of mammal species sighted and the location observed during the summer of 1977 (see Appendix I) was translated into a map showing the areas preferred by particular species (Map 9).

Since a trip to the areas indicated in Map 9 was usually rewarded with the opportunity to watch a mammalian species, it became clear that these areas provided one or more of that particular mammal's habitat requirements. As a result, Figure 9 like the corresponding map for bird sightings provided a data base for decisions regarding management policies for the delineated areas and contiguous areas of the park.



MAP 9

Areas in Beaudry Provincial Park preferred by some mammalian species observed, summer, 1977

E C	Eastern Cottontail
A B	American Beaver
R	Raccoon
S S	Striped Skunk
WT D	White-Tailed Deer
●	Beaver Dam
△	Beaver Scent Mound
■	White Tailed Deer Fawn
—	White-Tailed Deer Trail

Limit of Park Lands

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Chapter 3

CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

The conclusions arising from this study of the wildlife and vegetation resource of Beaudry Provincial Park follow.

1. These park lands are endowed with a great diversity of plant, avian and mammalian life. In the summer of 1977, two hundred and two species of plants, ninety-five species of birds and nineteen mammalian species were observed. The diversity of species can be attributed to the variety of habitats existing in Beaudry Provincial Park. The extensive riparian habitat, as a result of the availability of water, "edge effect" and relative lack of recent disturbance by man, was found to support avian, semi-aquatic and upland wildlife species. The oak/meadow habitat type was also found to support a diversity of mammalian and avian species. However, its importance lies in its provision of food and cover for a white-tailed deer population. The other habitats of Beaudry Provincial Park are Wetland and True Prairie. Both contribute significantly to the diversity of plant and animal life of Beaudry Provincial Park however, manipulation will be required if these habitats are to each their potential to support an even greater variety and number of plant and animal species.

   An outcome of the vegetation inventory was the identification of rare and/or fragile plant species which require protection when recreational developments occur in the park. Lopseed,

(Phryma leptostachya), a rare plant species in Manitoba (Johnson, personal communication, 1978) is found in the riparian habitats of Beaudry Provincial Park, and most frequently so in the Jail Riverbottom Forest. Other rare plant species, or those depleted by human activity, found in Beaudry Provincial Park are Nodding Trillium (Trillium cernuum), Small Yellow Lady's Slipper (Cypripedium calceolus var. parviflorm), Spotted Coral-root (Corallorrhiza maculata), Indian-Pipe (Montropa uniflora), Climbing Bittersweet (Celastrus scandens), and Gentain (Gentiana andrewsii). Plant species which are fragile and therefore, require protection are Ostrich-fern (Matteuccia struthiopterus var. pensylvanica) and Rattlesnake-fern (Botrychium virginianum). In addition Riverbank Grape (Vitis riparia) and Nightshade (Solanum dulcamara), species which are significant features of the park as well as the tall grass prairie species, should be protected.

2. Each plant community in Beaudry Provincial Park is assumed to support one or more species of wildlife, and for the purposes of this study, represents a Wildlife Habitat Type (habitat). The habitat types of Beaudry Provincial Park are delineated on the basis of a Habitat Classification System developed for Beaudry Park (see Map 4 and Table 2).
3. The following Wildlife Management Recommendations to maintain and/or enhance the diversity and abundance of the wildlife species and their habitat in Beaudry Provincial Park were proposed.

1. Hunting of the wildlife resource of Beaudry Provincial Park should be prohibited.

2. Efforts should be undertaken to improve and/or enhance the existing wildlife habitat.

3. The inadequate habitat areas available in Beaudry Provincial Park should be improved and efforts should be undertaken to rehabilitate habitat where the potential still exists.

4. Wildlife species extirpated in the area in the recent past should be re-introduced where the appropriate habitat or potential for its provision still exists.

5. Buffer zones to wildlife habitats available in Beaudry Provincial Park and woody plantings as cover for the movement of wildlife in the parklands should be provided.

6. An Interpretative Program should be fully developed for Beaudry Provincial Park.

The measures suggested to realize these recommendations are:

a. Habitat management through:

   i. vegetation management which entails the protection of the vegetation of the riparian, oak/meadow and hydric river shoreline habitats and re-establishment of riparian habitat in the Aspen-Riparian Habitat area as well as expansion and improvement of the True Prairie/Aspen Community and Wetland Habitats and

   ii. application of the Land-Use Zones for Manitoba's Parks and thereby restrict the extent of human recreational access and use of the vegetated areas of Beaudry Park;

b. Prohibition of consumptive recreational activities, i.e., hunting;

c. Re-introduction of certain wildlife species; and

d. Development of an Interpretative Plan.

3.2 Recommendations

1. The Land-Use Zones of Beaudry Provincial Park (Map 9) which synthesizes the wildlife and vegetation concerns expressed

in this document and which was developed from the delineation of Wildlife Habitat Cover Types (Map 4), should be incorporated in future development plans for Beaudry Provincial Park.

2. The Wildlife Management Recommendations for Beaudry Provincial Park should be thoroughly examined prior to development of Beaudry Park and should be adopted wherever overriding concerns do not prohibit such. One example of an overriding concern would be an extreme negative reaction by neighbouring farmers to the re-introduction of porcupines.

   These recommendations are general in nature and therefore, could also be applied as a framework for consideration of any Park's vegetation and wildlife resources during the planning stage.

3. An Interpretative Plan for Beaudry Provincial Park which incorporates the results of this study should be developed immediately.
4. The usefulness of the background data on wildlife and plant populations characteristic of Beaudry Provincial Park prior to development, as collected by this study, should be capitalized through the implementation of a continuing inventory program. In this program, an inventory of the vegetation and wildife populations would be conducted following the park development but before the park is opened for public access, and every three to five years thereafter. The first inventory would determine impact on the natural vegetation and displacement of fauna as a result of development. The subsequent inventories would provide up to date data to be utilized in the formulation of management strategies of the park's wildlife and vegetation resources and would give an indication of the effectiveness of

wildlife management measures instituted in the past as well as the affect of recreational development upon the vegetation and wildlife resources.

3.3 Areas of Further Research

1. A study of the feasibility of developing the Retention Pond as a marsh should be undertaken. This study should include a survey of the existing vegetation surrounding the Retention Pond and the determination of the water quality, soil, and water flow into the pond in the spring. The feasibility study should also determine the type of dam and/or modifications best suited as a control of the water level in the marsh, should the study recommend development of the pond into a marsh.
2. The feasibility of the re-introduction of Sharp-Tailed Grouse given the expansion of the Prairie/Aspen Community Habitat, and the re-introduction of the Ruffed Grouse and American Porcupine in the riparian habitat type should be studied.
3. A study of year-round wildlife movement routes within Beaudry Provincial Park should be conducted to determine the habitat types most valuable to the wildlife resource on a year-round basis and to delineate movement corridors.
4. An inventory of the fish resource should be conducted to determine the potential of this resource for recreational activities such as fishing and interpretation.
5. Stream dynamics has been an important influence in the present character of the soils and natural vegetation of Beaudry Provincial Park. Therefore, this aspect should be fully researched and incorporated in the Interpretative Program for Beaudry Provincial Park.

6. The data for the natural vegetation and wildlife resources of Beaudry Provincial Park presented in this document should be used to identify site types for recreation facilities by a Landscape Architect.

7. A study of the effects of Dutch Elm Disease, the Portage la Prairie Diversion, and the Garrison Diversion upon the vegetation and wildlife of Beaudry Provincial Park should also be considered.

Appendix A

LEGAL DESCRIPTION OF BEAUDRY PROVINCIAL PARK LANDS

The following described lands in the Province of Manitoba are designated as Provincial Natural Parks, to be named as: "BEAUDRY PROVINCIAL PARK" (Order-in-Council, January 22, 1975).

All those portions of the Parish of Saint Francois Xavier in Manitoba according to plans of same registered in the Winnipeg Land Titles office as No.'s 4600 and 5066 respectively and of the Assiniboine River including land and land covered by water which are contained within the following limits, namely: Commencing at the intersection of the Northern limit of the land taken for the right of way of the Canadian National Railways as the same as shown on a plan registered in the said office as No. 5110 with the Western limit of River Lot Nineteen of the said Parish; thence North along said Western limit to the Northern limit of land taken for a public highway as the same is shown coloured pink on a plan filed in the said Office as No. 3459; thence West along said Northern limit of said public highway to its intersection with a line drawn West of, parallel with and perpendicularly distant Three Hundred and Twenty-one feet from the Eastern limit of River Lot Twenty-one of the said Parish; thence North along said line to the right bank of the Assiniboine River; thence in general West, North and West directions following the said right bank of the Assiniboine River to its intersection with the straight production Southerly of the Western limit of River Lot Two Hundred and Ten to the Southern limit of land taken for a public road as same is shown on a plan filed in the said Office as No. 11552; thence East, South East, North and East along said Southern limit of the public road and the South Western and Eastern limits of land taken for a Drain as same are shown on said plan No. 11552 to the Eastern limit of Parcel One as same is shown on a plan filed in the said Office as No. 9584; thence south and South East along said Eastern limit and the South Western limit of Parcel Two as shown on said Plan No. 9584 to the Eastern Limit of River Lot Two Hundred and Sixteen of the said Parish; thence South along said Eastern Limit of River lot Two Hundred and Sixteen to the left bank of the Assiniboine River; thence, commencing in a North Easterly direction, following the said left bank downstream around its successive bends to its intersection with a straight line drawn Westerly across said Assiniboine River at right angles to the Eastern limit of River Lot Four of the said Parish from the point of intersection of said Eastern limit of River Lot Four with the right bank of said Assiniboine River; thence East along said lastly described line to the said Eastern limit of River Lot Four; thence South along said Eastern limit to the said Northern limit of the right of way of the Canadian National railways as shown on said plan No. 5110; thence West along said Northern limit to the Eastern limit of land taken for Station Grounds in River Lots Eight to Eleven, both inclusive of the said Parish as shown on said Plan No. 5110; thence North along said Eastern limit of Station Grounds to its intersection

with a line drawn South of, parallel with and perpendicularly distant Sixty-four and five-tenths feet from the Northern limit of said Station Grounds; thence West along said line and along a line drawn Westerly across River Lots Twelve to Seventeen, both inclusive of the said Parish, the said lastly mentioned line being North of, parallel with and perpendicularly distant Thirty-five and five-tenths feet from the said Northern limit of the right of way of the Canadian National Railways as shown on said plan No. 5110; thence South along the Western limit of said River Lot Seventeen to the said Northern limit of the right of way of the Canadian National Railways; thence West along said Northern limit to the point of commencement, subject to a Right of Way over and upon said Parcel One as shown on said plan No. 9584 and as more particularly described in a Transfer of Parcel Two as shown on said plan No. 9584.

The following described lands, formerly owned by Headingley Provincial Jail will also be designated as Beaudry Provincial Park in the future through an Order-in-Council.

All those portions of River Lots Thirty-two to Thirty-four, both inclusive, of the Parish of Headingley, in Manitoba, according to a plan of same registered in the Winnipeg Land Titles Office as No: 4067, designated as Parcel Thirteen and shown bordered pink on a Plan of Survey filed in the said Office as No: 12359.

All those portions of River Lots Two Hundred and Twenty-two, Two Hundred and Twenty-three, Two Hundred and Twenty-four, Two Hundred and Twenty-six and Two Hundred and Twenty-Seven all of the Parish of Saint Francois Xavier, in Manitoba, according to a plan of same registered in the Winnipeg Land Titles Office as No: 4600, designated as Parcel Thirteen and shewn bordered pink on a Plan of Survey filed in the said Office as No: 12359. Excepting thereout all that portion of said River Lot Two Hundred and Twenty-four, shewn outlined in red on a plan filed in the said Office as No: 4559.

All those portions of River Lots Two Hundred and Twenty-four and Two Hundred and Twenty-five all of the Parish of Saint Francois Xavier, in Manitoba, shewn outlined in red on a Plan of Survey filed in the Winnipeg Land Titles Office as No. 4559, now designated as Parcel Thirteen and shewn bordered pink on a Plan of Survey filed in the said Office as No: 12359.

Appendix B

A HISTORICAL AND PHYSICAL DESCRIPTION OF BEAUDRY PROVINCIAL PARK

B.1 History of Park Land Acquisition

B.1.1 Background

River banks are a major green belt, recreation resource base and scenic environment in Winnipeg's urban and exurban areas. The preservation of these lands for the enjoyment of the public has recently become a governmental priority. Riverbank property close to Winnipeg has been rapidly used up by unplanned residential development as a result of the accelerating movement of urban residents into the urban fringe or exurban areas. Such residential developments have often resulted not only in environmental deterioration and the encroachment of lands offering the best potential for filling the recreation needs of Winnipeg residents, particularly the older and lower income groups, but have, in fact, generated problems for the exurban resident and the rural municipalities bordering Winnipeg. Some specific problems are the exurbanites' demand for flood control as their residential development has been on scenic river lots subject to flooding, high service and pollution costs to the exurban resident as a result of his disregard for soil capability for septic fields prior to residential development, and the exurbanites' demands for the provision of high quality education facilities, commercial services, and improved transportation networks by their rural municipality (Wang, 1975). The purchase of riverbank property for recreational use is a means to divert residential developments to other areas to ensure protection of this historic river landscape and to provide additional recreational benefits to all Manitobans. The establishment of linear

parkways and greenspace along the Red and Assiniboine Rivers is one objective of the Parks Branch, Manitoba Department of Tourism, Recreation and Cultural Affairs. In combination with the riverbank acquisition program proposed by the City of Winnipeg in 1972, this objective will serve to extend control of River property and augment existing areas of greenspace and park spaces along these rivers for public access and use.

B.1.2 History of Beaudry Provincial Park's Inception

Due to increasing recreation needs of the residents of Winnipeg and the tourism demands of visitors, the Province of Manitoba initiated a research project in early 1973 designed to identify alternative locations for the development of Provincial park lands in the Red and Assiniboine Rivers area and study their potential for development (Wang, 1975 and Hilderman, 1974). The Red and Assiniboine Rivers Tourism and Recreation Study concluded:

> "Within the local recreation use for the (Red and Assiniboine River study) area, the Beaudry area is of critical importance for the preservation of unique undisturbed bottomland and the establishment of a major extensive use regional park. This area is of the highest priority for the retention of adequate recreational open space in the study area." (Hilderman and et al., 1974:13).

The principal objectives for the establishment of Beaudry Provincial Park were:

"1. To further the government's objectives of the establishment of linear parkways and greenspace along the Red and Assiniboine Rivers;

2. To provide day-use facilities for Winnipeg residents as a means to alleviate existing and future use pressures on existing recreation facilities in and around the City of Winnipeg;

3. As a link in a linear parkway system to encourage linearly-oriented recreational activities such as canoeing, hiking,

cross-country skiing, snow-shoeing, and bicycling by providing a terminus for such activities close to the City of Winnipeg;

4. To protect several significant ecological communities, to establish a wildlife and waterfowl preserve and to provide facilities for the non-consumptive enjoyment of these features by the public;
5. To establish an outdoor education centre
   a. for interpretation of the natural phenomena found in this park site, and
   b. as a means of introducing who will use this, and other parks in the system to the finite details of nature;
6. To provide a site for development of a historical railway display and encourage success of the Prairie Dog Express;
7. To ensure that greenspace is left along the Trans-Canada Highway approaching Winnipeg, and
8. To provide space for development of an additional Trans-Canada Highway campground if such is required."(Expropriation Hearings 1975).

B.2 A Review of Beaudry Provincial Park's Historical Setting[1]

Beaudry Provincial Park is of interest to Parks Branch not only for its biological characteristics but also for its historical significance. As a result and as a means to provide a holistic setting of the nature of Beaudry Park, a very brief sketch of some of the historical attributes of Beaudry Park will be mentioned.

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[1] This section is based largely upon research conducted by Robert Doyle in the summer of 1977 for the Historic Resources Branch, Department of Tourism, Recreation and Cultural Affairs and C.B. Gill, park consultant, May, 1974 and personal communication with Grant H. Nerbas, Regional Council, Canadian National Railway, Winnipeg, (1978).

Beaudry Park is located in an area which has been known as the White Horse Plain (Le Prairie du Cheval Blanc) for two and a half centuries. In 1824 Governor George Simpson granted the land extending six miles westward along the Assiniboine River and six miles in depth from the riverfront, beginning twelve miles west of the forks of the Red and Assiniboine Rivers to Cuthbert Grant (also known as the "Warden of the Plains"), the leader of the Metis forces at the Massacre of Seven Oaks. With Grant's persuasion, the former inhabitants of Pembina settled upon this tract of land and the foundation for the settlement of Grantown (or the Parish of Saint Francois Xavier as it later came to be known) was established. This settlement functioned to offset the forces of the Sioux nation and thereby provided protection for the Red River settlers. Although the land granted to Grant was ideal for farming, the economic activities of its inhabitants were hunting, trapping, trading and fishing.

In 1836, George Taylor began the Old Settlement Survey in which thirty-six miles of land bordering the Assiniboine River was divided according to the River Lot System. The Principal Meridian, which crosses the property of River Lot six and River Lot two hundred and twenty-four in the Parish of St. Francois Xavier, was surveyed in September, 1869. This Principal Meridian was the beginning of the Dominion Land Survey System which divided land in Western Canada by the System of Section, Township, and range.

A number of transportation routes passed through or near[1] to what is now Beaudry Provincial Park. These routes are the trails of the

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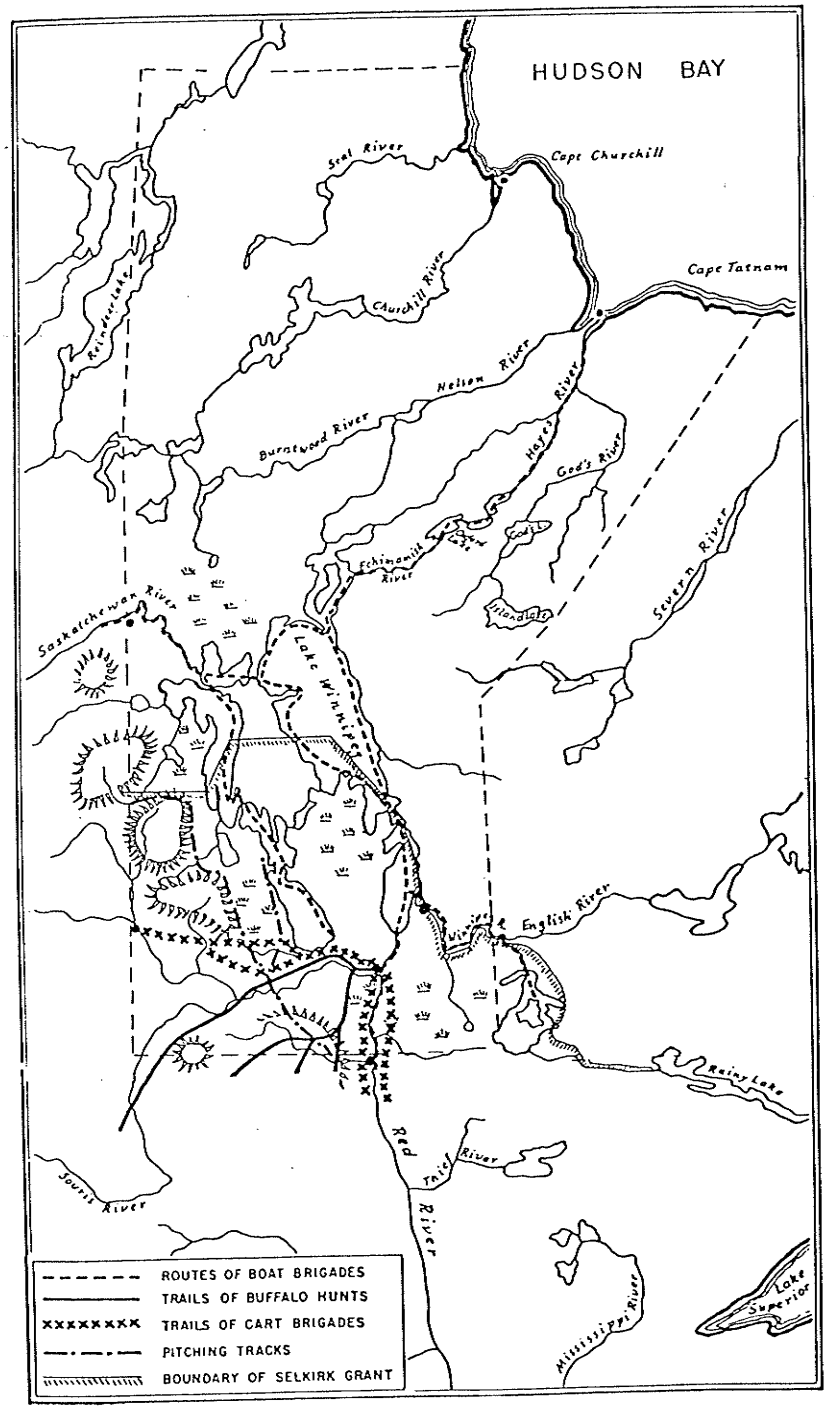
[1] Research of historical documents is required to ascertain whether or not the Portage Trail and the Buffalo Hunt Trail did pass through Beaudry Park since their exact location is not clear in the map provided in Map 10.



Map 10. Trails and Routes in Manitoba, 1811-1869
Source: Morton, 1976:83.

Buffalo Hunts, the Red River Cart Route, ("Portage Trail") and later the railroads. With the introduction of the railroad the importance of the previous transportation route, the "Portage Trail" declined. The Cabot Subdivision, of the Grand Trunk Pacific Railway line (Canada's third Transcontinental Railway) ran through the Beaudry Property.[1] This line was constructed in 1908 under authorization by Chapter 122, Statutes of Canada. In 1919, it became part of the National Railway Company by amalgamation. Following 1963, traffic on the Cabot subdivision was reduced to "as required" freight service only; abandonment of the portion of the Cabot subdivision between Cabot and Pacific Junction (Winnipeg) was granted in July, 1975.

The Grand Trunk Pacific Railway Company constructed a station at Beaudry in 1911 at a cost of $2,100.00. This station was named after Rev. P. Patrich Beaudry, O.M.I., the first French Metis Priest in the west. With the discontinuation of passenger service on the Cabot subdivision in 1963, this station lost its usefulness and was sold and moved to River Lot fifteen in the Parish of St. Francois Xavier for residential use.

B.3 Physiographic Location

Beaudry Provincial Park is located in the Red River Plain of the Manitoba Lowlands. The Manitoba lowlands, one of four physiographic regions in Manitoba, is a flat expanse in the central and lower-lying part of the Lake Agassiz Basin. The Red River Plain, a physiographic subdivision of the Manitoba lowlands, is a clay basin exhibiting local

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[1] The Rivers subdivision of the Canadian Northern Railway, an original rival of the Grand Trunk Railway, is located along the southern boundary of Beaudry Park. It was constructed in 1901 and continues operation today.

floodplains and river levees that occupy the flat depressional section which was once covered by the deep waters of Glacial Lake Agassiz for a short time (Ehrlich, et al., 1953).

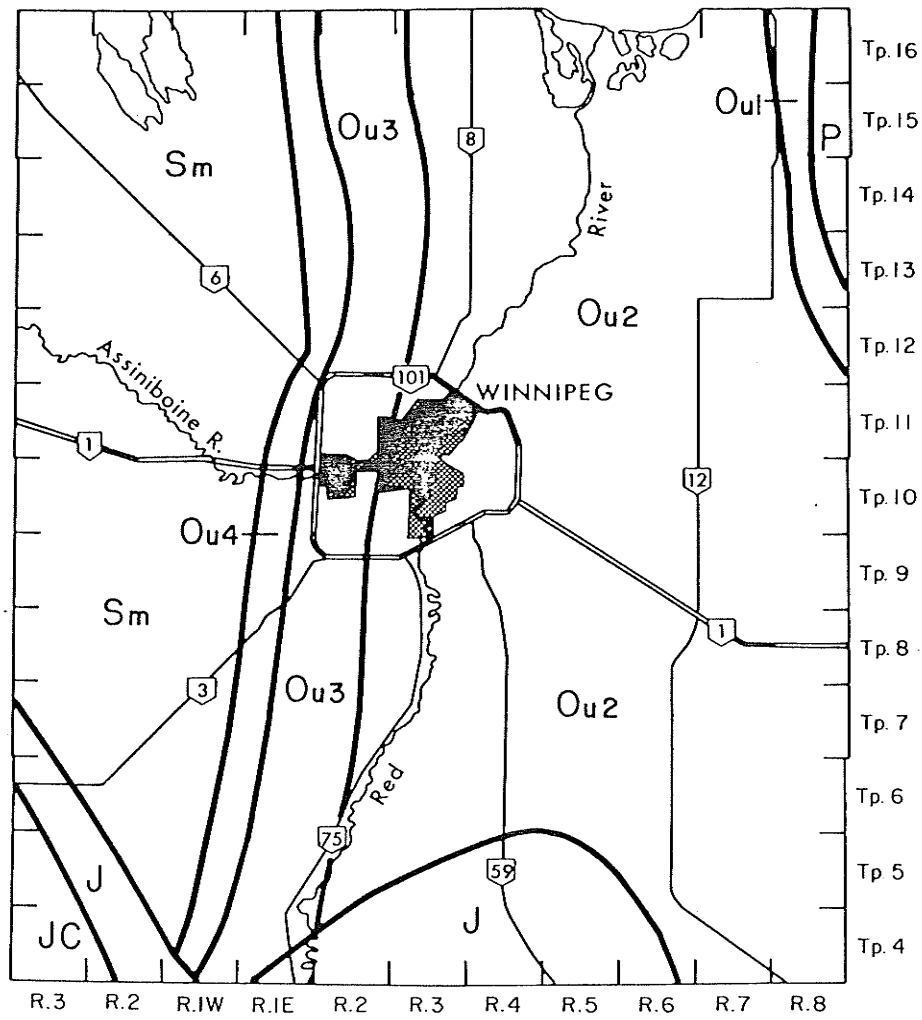
B.4 Bedrock Geology

The bedrock formations underlying the surface deposits of Beaudry Park are rocks of the Silurian period belonging to the formations of the Interlake Group (Michalyna et al., 1975). The Interlake Group strata is mainly dolomite varying in texture from fossilferous fragmental to cryptocrystalline evaporitic rock types (McCrossen et al., 1964). The top part of the Interlake Group in Southern Manitoba has been removed by pre-middle Devonian erosion and the thickness decreases from four hundred (400) feet in southwest Manitoba to zero at the erosion edge just west of Winnipeg (i.e., Beaudry Provincial Park) (Davies et al., 1962: 137). Fossils are frequent in the Interlake Group. These rocks consist of reef deposits; the greater part of the strata was deposited in shallow seas. Beaudry Provincial Park is located immediately west of an area of surface contact between two geologic systems (see Map 11). The underlying rocks to the east of Beaudry Park belong to the Stonewall formation which is considered to be of Upper Ordovician age and which also consists of dolomite (Davies et al., 1962:136).

B.5 Surficial Geology

B.5.1 General Surficial Geology

The surface geology at Beaudry Provincial Park is the result of dynamic geological processes that occurred during glaciation, subsequent inundation by Glacial Lake Agassiz, and its eventual recession. As a result of the actions of continental ice sheets and glacial melt water during the Pleistocene epoch large quantities of material from bedrock



MESOZOIC

Jurassic and Cretaceous (Lower Cretaceous and Earlier)

JC — Sand, sandstone, glauconitic sand, shale, clay
Includes Swan River Formation of Lower Cretaceous age

Jurassic or Earlier

Amaranth Formation: Shale, calcareous sandstone, siltstone, argillaceous limestone, dolomite, anhydrite, gypsum

PALAEOZOIC

Silurian (Middle)

Sm — Middle Silurian Interlake Group: Includes Cedar Lake, Atikameg, Moose Lake, Inwood, and Fisher Branch Formations; dolomite

Ordovician (Upper)

Ou4 — Stonewall Formation: Dolomite, dolomite conglomerite
Ou3 — Stony Mountain Formation: Calcareous shale, dolomite,
Ou2 — Red River Formation: Dolomitic limestone and dolomite
Ou1 — Winnipeg Formation: Sandstone, shale

PROTEROZOIC OR ARCHEAN

P — Granite, granodiorite, quartzdiorite, gneiss, schist undivided

Map 11. Bedrock Geology of the Winnipeg Region
Source: Michalyna et al., 1975

was plucked and transported over large areas and then deposited. Glaciation covered Central Manitoba with glacial till derived from limestone and igneous rock. Although the original glacial till was an unsorted mass of boulders, cobbles, gravel, sand, silt and clay upon deposition, the erosive forces of the waters of glacial lake Agassiz profoundly modified it to the well-sorted glacio-lacustrine deposits characteristic of the glacial lake basin. When the glacial lake had receded to the lowlands alluvial sediments continued to be deposited in the lower parts of the lake basin by streams. The Assiniboine River was one of these delta-forming affluents.

B.5.2 The Red River Plain

The Red River Plain is covered with glacio-lacustrine and alluvial deposits. The glacio-lacustrine deposits consist of thick layers of clay and silt that settled out from the water of Lake Agassiz. These sediments were deposited on top of till and consist of a lower clay unit deposited in the deep water of Lake Agassiz I and an upper silt unit deposited in the shallower water of Lake Agassiz II. The lower clay unit is 20 to 40 feet deep, the silt unit is 15 feet thick (Davies et al., 1962). In recent geological history, the glacial clays of the Red River Basin were covered by three to 15 feet of calcareous silty clay, probably deposited during flood stages of the Assiniboine River (Davies et al. ,1962).

B.6 Relief and Drainage

As a function of its glacio-lacustrine surface deposits the topography of the Red River Plain is level to very gently sloping.[1] In addition the Red River Plain is located in the mid-continent topographic low which is drained by the Red River and its tributaries, of which the

[1] The slope gradient is 3 to 5 feet per mile (Ehrlich et al., 1953).

Assiniboine River is one. Beaudry Natural Provincial Park is an example of this landscape. The Assiniboine River provides a topographic change from the otherwise flat terrain. A topographical map of Beaudry Park prepared from up-to-date (1975) aerial photography by the Surveys Branch of Manitoba Department of Mines, Mineral Resources and Environmental Management (see Map 12) illustrates the relief present.

Various sections of Beaudry Park exhibit some micro-relief. Although very subtle, the cultivated area of the Sair Property exhibits the low ridge and swale micro-relief characteristic of the Red River Plain. This micro-relief occurs as low clay ridges which are better drained interspersed with less well drained swales.[1] These parallel flats have a general northwest to southeast orientation. Water ponds within the swale[2] positions and must flow either northwest or southeast depending on the slope of the area. Spring-run-off into the swale areas of the Sair property results in the creation of an ephemeral stream emptying into the Assiniboine River.[3] Further to the south of Beaudry Park (south of the Beaudry Property), the northwest flow originally resulted in the creation of an intermittent stream which emptied into the Assiniboine River. This drainage channel was first dammed in 1952 by Ducks Unlimited (Canada) (Woolison, personal communication).

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1 The clay ridges characteristically are mapped as Red River Series soils and the swales are mapped as Osborne Series soils. These soils are discussed in a following section.

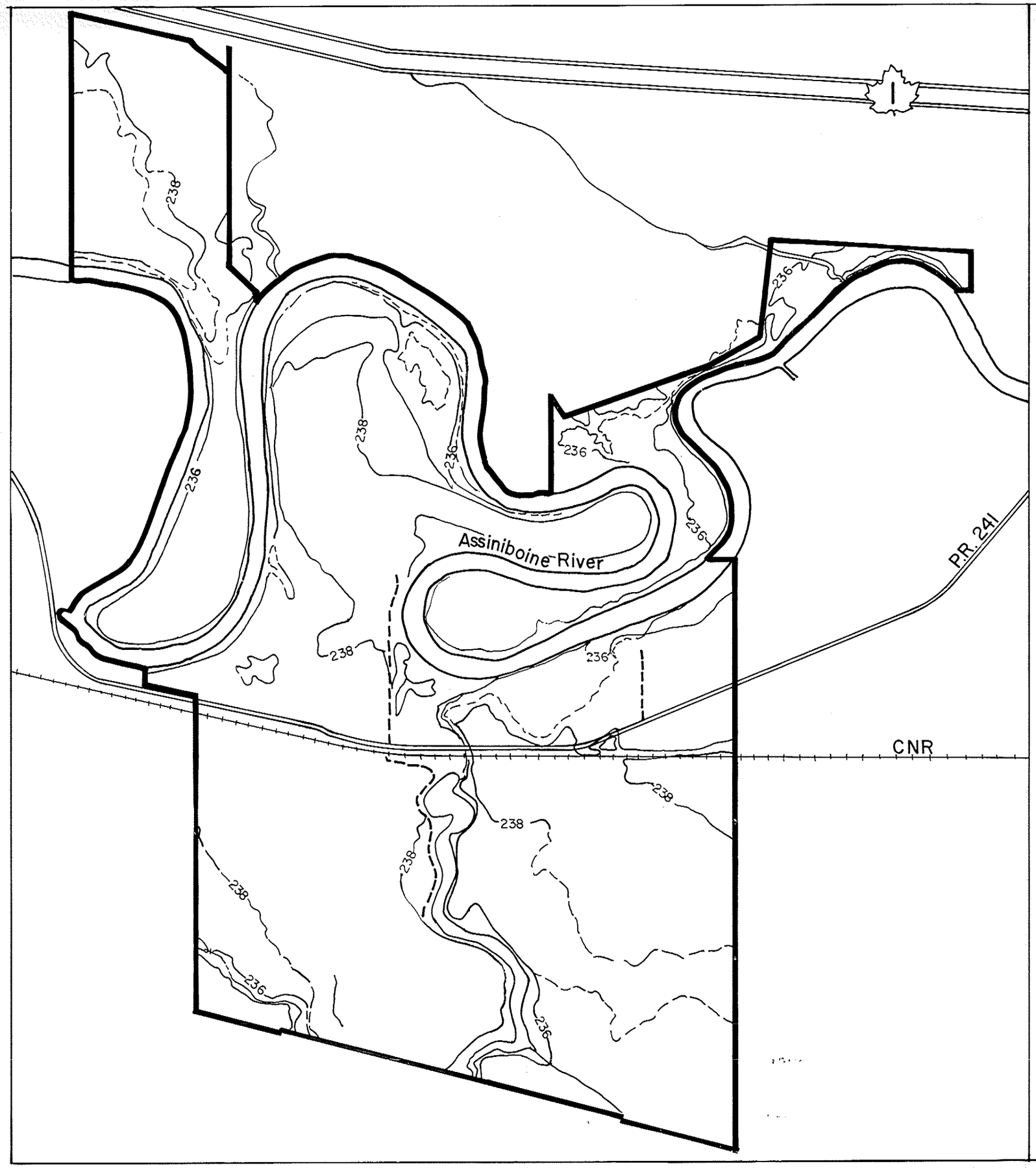
2 The ponding problem within swale positions still exists even though construction of drainage ditches channels a considerable flow from the higher land to pass into an established stream. (Mechalyna et al., 1975).

3 Run-off water flows to the southeast into the lower Assiniboine River.

MAP 12

The relief and drainage of Beaudry Provincial Park

—238— Contour interval



Limit of Park Lands

Unpaved Roads

NORTH

100 0 500 1000

metres

Micro-relief of another form is evident on the three peninsulas which have been formed as a result of the meanderings[1] of the Assiniboine River. Here meander scrolls created by the deposition of sediments along the inside or cut-off slope of the river and have resulted in a slightly undulating topography. The height of the meander scrolls vary from two or five feet. In those years in which the Assiniboine River overflows its banks, the intervening troughs are filled with flood water. The troughs may remain partially filled with water until the river reaches its summer level.

B.7 Hydrology

B.7.1 Stream Flow

As mentioned earlier the Assinboine River is a tributary of the Red River. The total length of the Assiniboine River (in Winnipeg) is seven hundred and forty (740) miles, (580 miles long in Manitoba). Its total drainage area is 62,800 square miles (Hildebrand et al., 1975).

The typical bank height of the Assiniboine River above river bottom in Beaudry Park is in the range of twenty to twenty-six feet.[2] Its

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[1] If there is an approximate equilibrium between a river's energy and the supply of detritus in a certain middle section of the river, it is common for the river to flow in many bends and meanders. If the bends take a regular form they are called meanders (after the river Menderes in Turkey). A free or mobile meander forms when a twisting of the river's course, i.e., the line of maximum velocity is on the surface of the stream, occurs in a middle position between the banks of the river. As a result, the side nearer the line of maximum flow is then attacked more strongly by lateral erosion and the course of the stream becomes curved. The erosion increases with time because of centrifugal force and finally the bends are separated from one another by narrow necks. (Machatschek, 1969:47).

[2] Typical bank height above the riverbottom is 20 feet in St. Francois Xavier and 26 feet at Headingley.

channel ranges from 200-250 feet in width[1] (Hildebrand et al., 1975). Table 3 gives the average level of the Assiniboine River at Headingley. This data indicates that the Assiniboine River peaks in April (break-up) reaching a depth of eight feet, and then drops gradually through the summer and fall to a low of four feet in November (freeze-up). The minimum monthly depth for the year is three feet at Headingley. It is important to note that this data is for Headingley and, although the river is generally broad and shallow the values for depths upstream (i.e. Beaudry Park) may differ due to the great variability of the river's structure in cross-section. In the summer of 1977, it was noted that the Assiniboine River was extremely low, ranging from three-quarters to two feet in depth. Heavy rains however, often resulted in a one foot increase in depth.[2]

B.7.2 The Floodplain and Water Table

A floodplain is defined as a strip of relatively smooth land bordering a stream that is most frequently flooded; the floodplain lies within the meander belt of the river or stream (Hilderman et al., 1974). The floodplain of Beaudry Park is delineated on the basis of the 1969 flood limit and is illustrated in Map 13. The floodplain is several times the width of the Assiniboine channel and is well defined as a result of its position fifteen to twenty feet below the adjacent plains (Hilderman et al., 1974). The floodplain supports outstanding tracts of rich bottomland vegetation.

Figure 1, the cross-section of the Assiniboine River meander belt at St. Francois Xavier gives some indication of the variability in river

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[1] The range in channel width (October, 1973) is 150-250 feet at St. Francois Xavier and 250-350 feet at Headingley.

[2] Measurements of stream flow, bank height and river level at Beaudry Park will have to be undertaken if accurate data for these hydrological features are to be provided.

Table 3. The Average Level of the Assiniboine River at Headingley, Manitoba in Feet Above Sea Level*

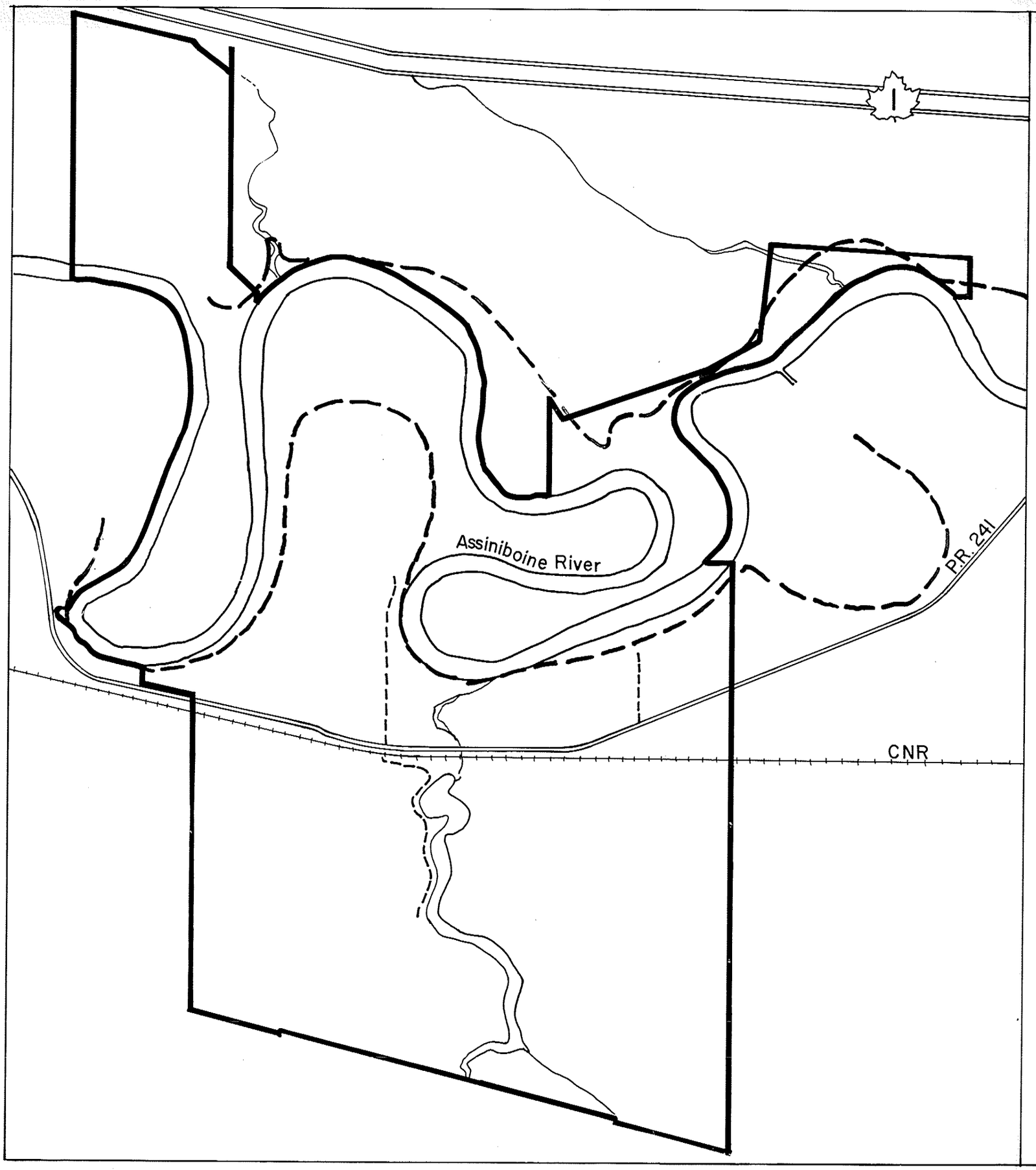
	Minimum	Maximum	Mean
January	756.0	757.9	756.7
February	756.0	757.7	756.6
March	756.1	758.4	756.9
April	757.1	766.0	761.3
May	757.5	769.0	762.1
June	756.9	767.0	760.5
July	756.6	766.0	759.6
August	756.2	762.0	758.3
September	756.3	759.7	757.5
October	756.5	760.7	757.5
November	756.5	759.7	757.2
December	756.1	758.6	756.9

* Levels were calculated from historic flow records (1913-1967)

Source: Hilderman et al., 1974

MAP 13

The floodplain of Beaudry Provincial Park



Floodplain

Limit of Park Lands

Unpaved Roads

NORTH

100 0 500 1000

metres

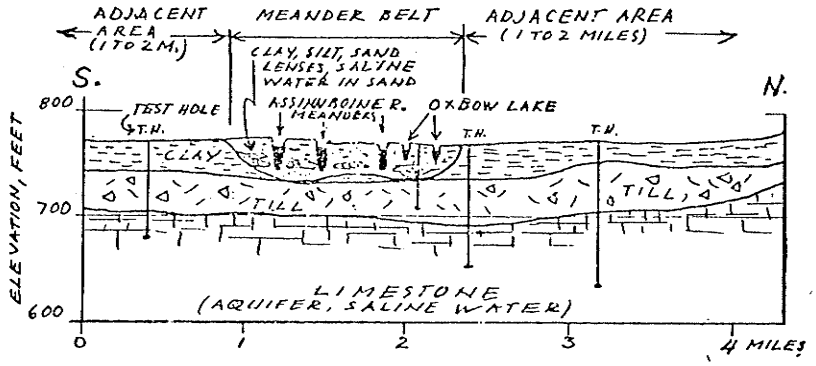


Figure 1. Cross Section of the Assiniboine River Meander Belt at St. Francois-Xavier. The section shows hydrogeological conditions typical for the reach from Portage la Prairie to Winnipeg.
Source: Gray, 1978

levels (due to variability in riverbed depth) and the depth of the water table. In general, the water table in the meander belt would tend to be equal with the river level (Gray, personal communication, 1978). Test pits in the Sair meander loop of Beaudry Park indicate that the soil profile consists of an upper clay (or silt) layer three to eight feet thick underlain by a fine sand layer varying in thickness from three and a half to more than eight feet (Dearman, 1977). During flood periods, the water table in the sand layer would rise with the river level to the bottom of the upper clay layer where it is prevented from rising further (Dearman, 1977). The water table in the areas adjacent to the meander belt (see Figure 1) is located in the limestone layer. The depth of limestone acquifers present range from 50 to 100 feet below ground level. However, the water in these acquifers in salty and "practically no potable water acquifers are present along the Assiniboine River from St. Eustache to Winnipeg" (Gray, personal communication, 1978). The level of the water table in the meander belt results in the great supply of soil moisure to the vegetation of the floodplain. The water table in the areas adjacent to the meanderbelt area does not have any effect on the vegetation, here the soil moisture is supplied by precipitation.

B.8 Soils

Like all soil formations the soils of Beaudry Provincial Park were produced by the action of six soil-forming factors on the material deposited by geologic forces.[1] The soils of Beaudry Park have been mapped

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[1] The characteristics of soil are determined by the physical and mineralogical composition of the original geological material (the parent material) the climate under which the soil material has accumulated and existed, the biota consisting of plant and animal life on and in the soil, the topography and resulting drainage, the actions of man and the length of time the forces of development have acted on the parent material.

as belonging to eight soil series:[1] Dencross, Fisher, Fort Garry, Osborne, Red River, St. Norbert, Scanterbury, and Seine River (Michalyna et al., 1975 and Chrlich, et al., 1953). Table 4 gives the classification of these soils according to the System of Soil Classification for Canada, Table 5 gives a key to the soils of Beaudry Park to be used with Map 14 which gives their location. A general description of the texture, parent material, topography and drainage, and the natural vegetation of each soil series drawn from Soils of the Winnipeg Region Study Area (Michalyna et al., 1975), follows. The genetic profile types of each soil series are included in Appendix J. Appendix K provides the ratings and limitations for these soils for recreational purposes.

Dencross Series

These soils developed under imperfectly drained conditions on a thin clay mantle overlying strongly calcareous silty lacustrine sediments which generally vary in thickness from 20 to 75 cm. and lacustrine clay below. The upper clay sediments of these soils have a moderately slow permeability; the silty strata exhibits a variable permeability from moderately rapid to slow due to variability of the silt content and thickness of the silt zone. The permeability of the underlying clay is slow. Run-off is slow. The native vegetation consisted of tall grass prairie and dispersed areas of aspen.

Fisher Series

These imperfectly drained soils developed on strongly to very strongly calcareous, stratified dominantly medium to moderately fine

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[1] A soil series is the basic unit in the System of Soil Classification for Canada. It is defined as a naturally occurring soil body such that any soil profile within the body has a similar number and arrangement of horizons, whose color, texture, structure, consistence, thickness, reaction and composition are within a narrowly defined range. The concept of soil series as a taxonomic unit is related to the soil body delineated on a map (Michalyna et al., 1975).

Table 4. Classification of Soils in Beaudry Natural Provincial Park According to the System of Soil Classification for Canada

Order	Great Group	Subgroup	Series
Chernozemic	Black	Orthic Black	Fort Garry
		Gleyed Black	Scanterbury
		Gleyed Carbonated Rego Black	Dencross
	Dark Gray	Orthic Dark Gray	St. Norbert
Regosolic	Regosol	Gleyed Cumulic Regosol	Fisher
			Seine River
Gleysolic	Humic Gleysol	Carbonated Rego Humic Gleysol	Osborne

Table 5. Key to the Soils of Beaudry Natural Provincial Park

I Soils developed on moderately calcareous lacustrine clay deposits

a. Well to moderately well drained

St. Norbert Series (Orthic Dark Gray)

b. Imperfectly drained

i. Red River Series (Gleyed Rego Black)

ii. Scanterbury Series (Gleyed Orthic Black)

*Soils developed on fine textures, somewhat stratified, moderately to stongly calcareous alluvial and lacustrine clay

c. Poorly drained

Osborne Series (Rego Humic Gleysol)

II Soils developed on a thin mantle of lacustrine clay over strongly calcareous sediments. Silty sediments are variable in thickness and are underlain by lacustrine clay within four feet of the surface.

a. Well to moderately well drained

Fort Garry Series (Calcareous Black)

b. Imperfectly drained

Dencross Series (Gleyed Rego Black)

III Soils developed on moderately to strongly calcareous, stratified, dominantly medium to moderately fine recent alluvial deposits

Imperfectly drained

Fisher Series (Gleyed Cumulic Regosol)

IV Soils developed on moderately to strongly calcareous stratified dominantly clay recent alluvial deposits

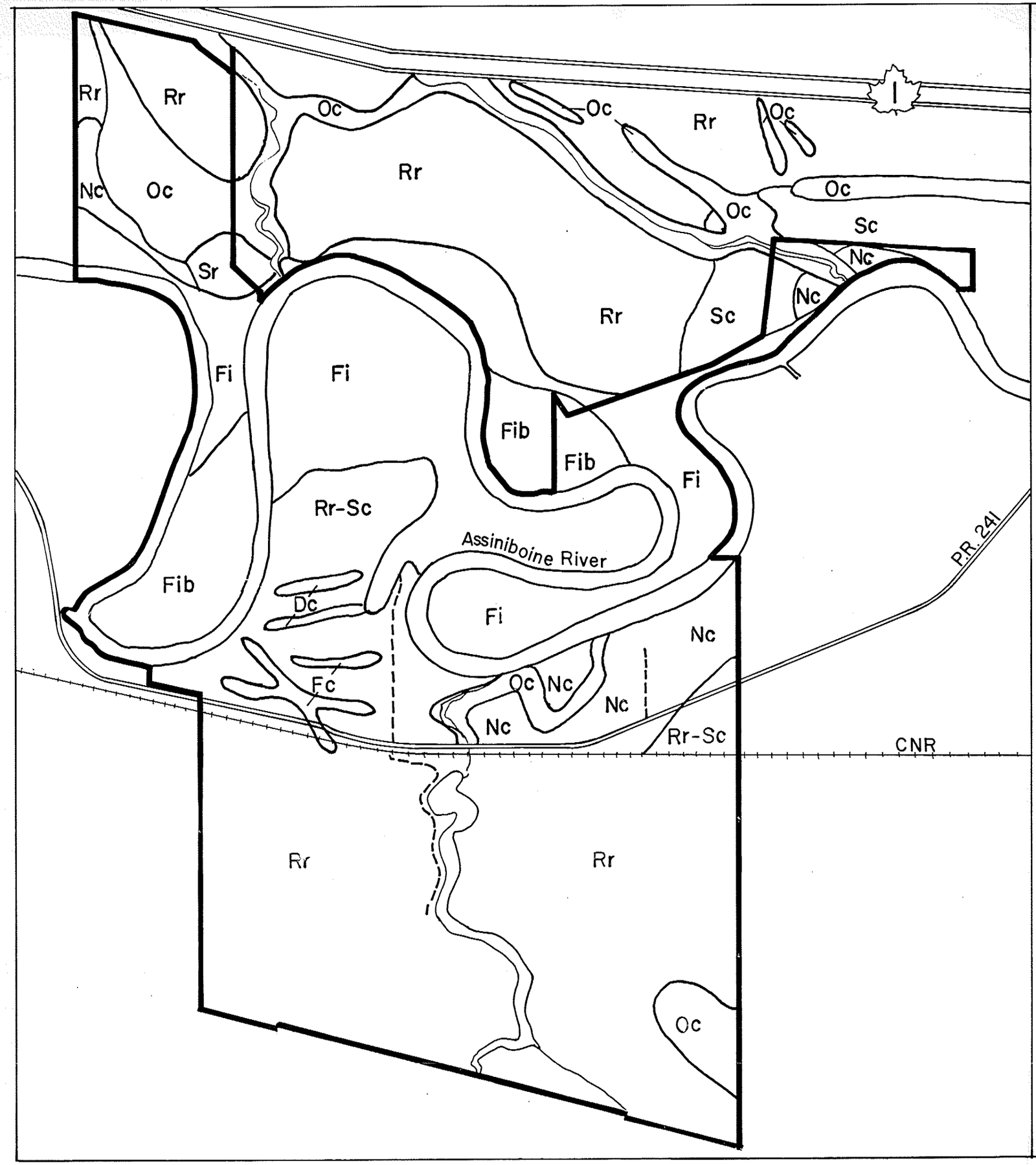
Imperfectly drained

Seine River Series (Gleyed Cumulic Regosol)

Source: Michalyna et al., 1975, pp. 25-28

MAP 14

The soils of Beaudry Provincial Park



Soil series

- Dc Dencross
- Fc Fort Garry
- Fi Fisher
- Fib Fisher (gently undulating)
- Nc St. Norbert
- Oc Osborne
- Rr Red River
- Sc Scanterbury
- Sr Seine River

Limit of Park Lands

Unpaved Roads

NORTH

100 0 500 1000

metres

textured alluvial sediments. Fisher series soils occur on the floodplain and levees of the Assiniboine and Red Rivers. The parent material horizon (C horizon) of the soil profile may contain darker materials representing former surfaces (Ahb, a buried surface horizon) which have been covered by more recent deposition of sediments. The topography is very gently to gently sloping. Internal soil drainage is slow due to a high water table and the slowly permeable layers. These soils may be inundated for short periods of time during spring run-off or after heavy summer rains. Aspen, black poplar and willow and elm and maple forests make up the native vegetation.

Fort Garry Series

These moderately well drained soils developed on thin moderately calcareous fine textured lacustrine sediments over a variable depth of very strongly calcareous silty sediments which overlie moderately calcareous lacustrine clay either within or below one meter depth. The silty sediments are generally 40 to 75 cm. thick but may vary to depths greater than 1.5 meters. The topography is very gently to gently sloping. Run-off is moderate and permeability is variable in the upper clay and silty layers being dependent on the texture and thickness of the stratified silty sediments. Although most Fort Garry soils are now cultivated, the native vegetation consisted of tall grass prairie invaded with occasional clumps of aspen or bur oak.

Osborne Series

These soils are poorly drained. They developed on moderately to strongly clacareous fine textured lacustrine and alluvial deposits. Their depressional topography corresponding to the swale in ridge and swale micro-relief characteristic of the Red River Plain results in poor drainage. Run-off is negligible to very slow and permeability is slow.

The native vegetation consists of meadow grasses, sedge, reeds, cattails and some willow.

Red River Series

These imperfectly drained soils developed on moderately to strongly calcareous fine textured lacustrine deposits. The topography is level to very gently sloping. This soil series corresponds to the ridges in the ridge and swale micro-relief found in the Red River Plain. In general, run-off is slow and permeability is slow but may be moderately slow in the lower horizons containing thin varves of silty deposits. Where silty varves occur, the horizontal permeability is substantially greater than vertical permeability.

St. Norbert Series

The soils of this series are moderately well to well drained, and developed on moderately calcareous, fine textured lacustrine and alluvial deposits. This soil type occurs on the well drained levees of local rivers such as the Assiniboine, La Salle, Rat, Red and Seine. Run-off is moderate; permeability is moderately slow to slow. The native vegetation is dominantly bur oak with some maple, elm, aspen; with hazel, Saskatoon and dogwood undergrowth and associated herbs and grasses.

Scanterbury Series

The imperfectly to moderately well drained soils of this series developed on moderately to strongly calcareous fine textured montmorillonitic lacustrine deposits. The topography is very gently sloping and run-off is moderate to moderately slow. The permeability of the soil is low. The native vegetation consisted of tall grass prairie.

Seine River Series

These imperfectly drained soils developed on moderately to strongly calcareous fine textured lacustrine and alluvial deposits. They generally

occur on the intermediate position between the river bed and upper levees of the Assiniboine, La Salle, Rat, Red and Seine Rivers. These soils are subject to seasonal flooding during the spring run-off period and as a result the C Horizon exhibits buried A or surface horizons. These soils have moderate run-off and moderately slow to slow permeability. The native vegetation of this series consists of Manitoba maple, elm, ash, basswood and native grasses.

Appendix C

WILDLIFE AND RECREATION

C.1 Wildlife as a Resource for Recreation

Three general values and uses of the wildlife resource which have developed in North American society over time are:

1. "utility or nuisance value (meat, furs, crop and livestock depredation, etc.)
2. consumptive recreational value (sport hunting), and
3. aesthetic or existence value (viewing, studying, photography, satisfactions from just knowing wildlife exist, recognition of ecological importance of wildlife, etc.)" (Shaw, 1974:153).

The evolution in wildlife attitudes since the settlement of this continent then is a response to a change from dependence on and fear of wildlife to the utilization of wildlife as a recreation resource (i.e., consumptive and non-consumptive use). These changes in the way we value wildlife have also been identified as the manifestation of cultural evolution in response to changes in the supply of wildlife resource numbers (Shaw, 1974).

Of the twenty-eight outdoor recreation activities listed in a user survey by the Bureau of Outdoor Recreation conducted in 1977, ten are directly or indirectly concerned with wildlife (Tross and Underhill, 1977). This, and the economic expenditure on outdoor recreation activities in the underlying hope to view wildlife attests to the importance of wildlife as a recreation resource.[1] It is important to emphasize here that

[1] Nature observers contribute substantially to the economy through the purchase of equipment, ie., photographic equipment, camping equipment, etc. Total annual expenditure of Canadian naturalists in 1966 was estimated at $162 million (Bryan, 1975). This monetary value is much greater today since the number of naturalists has increased from the 800,000 used to determine the estimate (in 1966 $).

people are the reason why wildlife is an important natural resource since its use provides both direct and indirect benefits. The use of wildlife and the demand to maintain its existence in numbers and diversity by non-consumptive wildlife outdoor recreationists usually results in indirect benefits to the remainder of society since more species of wildlife only occur in environments of increased quality (Longrie, 1976).

Responsible natural resource planning and management must respond to changes in the resource and resource demand. In the case of the wildlife resource, populations of a number of species are dwindling and its aesthetic and existence values have increased dramatically as a result. This value of wildlife can be expected to continue to increase in prominance as long as viewing wildlife becomes an unusual experience (Shaw, 1974). As that segment of the population which is concerned with the welfare of wildlife but does not hunt grows, the goal of wildlife management to maximize the intangible benefits resulting from non-consumptive outdoor recreational activities becomes increasingly important. A close relationship between recreation planning and wildlife management therefore, exists. Natural parks which incorporate the provision of nature conservation and preservation and recreation opportunities, often provide the best opportunity for recreationists to participate in non-consumptive outdoor recreation activities. The result is an eminent need to manage wildlife for non-consumptive recreational use within a framework of biological feasibility.

C.2 Wildlife Management

> "Wildlife management is the science and art of changing the characteristics and interactions of habitats, wild animal populations and men in order to achieve specific human goals by means of the wildlife resource. These goals may be sport recreation, but may also include or be restricted to aesthetic, economic and ecological goals." (Giles, 1971:1)

Wildlife management thus involves much more than meeting the biological needs of wildlife. It also requires the management of human activities that affect wildlife and human use of wildlife if it is to succeed. Specific objectives vary from locality to locality, since the needs of wildlife, human demands for wildlife use and the possibility of a successful program are ultimately the determining factors. The general objectives of wildlife management, not necessarily in order of importance, are:

1. preservation of species,
2. maintenance of populations of useful species,
3. stabilizing or increasing populations of certain species, and
4. limiting utilization to annual productive capacity.

For many years the general course of wildlife management based its work on "pleasing the sportsman": protect the desirable species and destroy everything which interferes or seems to interfere with that species. This type of management is no longer in use as a result of the recognition of the fact that unexpected results occur when the intricate relationships of a living community are disturbed in such a way. As a consequence of this awareness, wildlife management evolved into a field of applied ecology[1] In an effort to perpetuate wildlife resources for public use, ie., sport hunting, the principle of sustained yield hunting was adopted: wildlife can be harvested on a recurrent basis provided that the annual harvest and the natural mortality do not exceed the annual increment.

As is evident from the above discussion, wildlife management has traditionally been concerned with the provision or maintenance of wildlife specifically game species for consumptive recreational use. With the

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1 The theoretic basis of wildlife management is the ecological theory of wildlife populations.

shift in public opinion away from hunting (Shaw, 1974) and greater public concern for the welfare of game and non-game species of birds and mammals, and the increasing non-consumptive recreational use of wildlife the need to maintain the production of wildlife for non-consumptive recreation is becoming an increasingly important objective within the scope of wildlife management.

Three major methods of wildlife management or means to foster and increase game populations in use traditionally and today are:

1. preservation of breeding stock by means of game laws restricting harvest, etc.,
2. artificial stocking, and
3. habitat improvement.

Although habitat improvement or maintenance are more important to a wildlife populations' survival, the methods usually utilized were the first two (Odum, 1971).

The realization that the continued existence of a diversity of wildlife was endangered by the continuing decline in adequate habitat has resulted in the realization that wildlife habitat, itself, is a valuable natural resource. The value of wildlife habitat, especially in the light of increasing pressures to convert existing habitat into areas for agriculture, industrial and residential use has prompted the recognition for the need and importance of habitat maintenance and improval as the major tool of wildlife management. Thus, wildlife management has expanded its techniques to the actual management of the wildlife habitat both in terms of vegetation and water supply and in establishing the carrying capacity for human use.

C.3 Wildlife Management in Parks

As a result of the disregard for the value of wildlife habitat in the past, the major areas of remaining wildlife habitat in the populated areas are often parks.[1] Parks which are created for the preservation and conservation of the natural environment and the provision of outdoor recreation opportunities, i.e., Manitoba Natural Provincial Parks, usually possess large areas of wildlife habitat and therefore, usually support diverse and abundant wildlife populations. One goal for maintaining and developing Manitoba's provincial parks stated in Manitoba's Provincial Park Lands Act is to preserve and conserve the wildlife inhabiting it (Statutes (1972)(67, ch. 20, p.20, sec. 3(1)). Aldo Leopold's statement (1963):

> "....native species of wild animals should be present in maximum variety and reasonable abundance. Protection alone... is not adequate to achieve this goal. Habitat manipulation is helpful and often essential to restore or maintain animal numbers..." (Lowan, 1968:932).

although in reference to the national Park System in the United States is applicable to Manitoba's provincial parks, particularly those designated as Natural Provincial Parks, since it emphasizes the need for wildlife management in parks through the method of habitat maintenance and improvement.

The type of management of wildlife populations in parks through the provision of wildlife habitat advocated by Leopold in 1963 (Lowan, 1968) has been utilized in Canada's national Parks and is becoming an increased concern in Manitoba's Provincial Parks. This type of wildlife management

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[1] Woodlots, fencerows and stream and riverbanks do provide wildlife habitat in agricultural areas. Due to the nature of these habitats however, the area of habitat available is usually small in comparison to that available in provincial parks. Emphasis is also currently being placed upon the acquisition of remaining tracts of habitat as wildlife management areas.

is, in part, a response to the nature of parks. All but the very largest parks tend to be ecological islands which can rarely be self-regulating systems and thus, are affected by conditions in surrounding areas (National Academy of Sciences, 1970).[1] Conservation of animal's habitats in the park therefore, becomes a necessity for their survival i.e., enough habitat is not available in areas surrounding the park. Conservation of such habitats is closely associated with management of the vegetation on which the animal species depend, since animal populations require little or no management if the natural vegetation remains intact, and if provided with reasonable freedom from disturbance.[1]

C.4 Wildlife's Position in Parks

The recent trend in the preservation of natural environments and attempts to meet the open space requirements of ever-increasing numbers of outdoor recreationists has often resulted in government acquisition of natural lands. The natural environment endowment of these lands and their provision of space for outdoor recreational activities has usually resulted in their designation as "natural parklands". The objectives for the acquisition of natural parklands are to meet the demand of a wide array of outdoor recreation opportunities including those dependent upon wildlife and the preservation of the environment do "kill two birds with one stone" and has resulted in their singularly significant position. The potential conflict between recreationists and preservationist interests is a challenge for the park planners and resource managers alike.

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1 Parks usually cannot include the summer and winter ranges of all its wildlife inhabitants in its boundaries. An admixture of summer and winter ranges for wildlife can be considered to provide the park with control of sufficient of necessary wildlife seasonal ranges so that it can assure survival of a nucleus of a wildlife population regardless of changes outside the park.

With the increasing awareness that wildlife is an important recreational resource and the recognition that wildlife is an integral element in an environment's preservation, wildlife input into planning of natural park lands can be conceived as a method to resolve potential visitor/preservation conflicts.

In natural parklands, the preservation of one component of its environment: wildlife is matched by an opposing goal for the park; the provision of outdoor recreation opportunities. The wildlife management task in this case is clear. The composition and abundance of the wildlife inhabiting the parklands should be maintaned for the benefit of the outdoor recreationists utilizing the wildlife resource in their activities. Specific management practices which would ensure wildlife preservation are the provision of adequate habitat for wildlife species and the management of visitors in regard to wildlife.[1]

Fulfillment of this wildlife management objective however, requires the recognition and acceptance of the value of the wildlife resource as a factor which should be as much a consideration in the park planning process as engineering specifications. Wildlife preservation then must become a concern in the formulation of a park plan[2] for a "natural park" and further, that the plan implementation methods recognize the objective of wildlife preservation. Recognition of the economic and intangible benefits of wildlife as a recreational resource has recently been forthcoming as have the benefits of the contribution of wildlife information in ecologically sound planning decision in general (i.e., not exclusively to parks) (Tillmann and Monasch, 1976; La Nier, 1976; Brush, 1976 and Longrie, 1976).

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[1] Recent research using the Delphi technique indicated that by 1985 recreationists will accept restrictive management procedures to maintain and preserve vegetation, wildlife and water quality (Marsh, 1976).

[2] The formulation of a park plan is the culmination of stated goals designed to meet recognized needs such as the availability of recreation opportunities, environmental preservation, etc.

Appendix D

THE VEGETATION AND WILDLIFE INVENTORY RESULTS

D.1 General Distribution and Overview of Vegetation Types Studied

D.1.1 Riverbottom Forest

According to the distribution map of the natural or presettlement grassland and forest types of the southern Great Plains of Canada compiled by Watts (1969:94) the Aspen-oak Grove and True Prairie grassland types border at the present location of Beaudry Provincial Park. The description of the ribbons of riverbottom forest that developed along the river courses in these two grassland vegetation types states that American elm was confined "almost exclusively" to the river valleys in a natural state and that it occurred in association with Manitoba maple, basswood, and green ash. These four species of threes occurred in approximately equal frequency (Watts, 1969). A low thicket formed by several species of willows commonly bordered the rivers and streams (Watt, 1969).

The presettlement distribution of riverbottom forest is evident in Beaudry Park. Reference to Map 7, the vegetation map of Beaudry Provincial Park reveals that riverbottom forest occurs on the three meander peninsulas and isolated portions of the river bank of the Beaudry property. In general, the occurrence of riverbottom forest is a function of a low topographic position relative to adjacent areas, location in the floodplain (see Map 13) and presence of soils of the Fisher Series.

In areas of riverbottom forest the soil moisture supply is in excess of that falling as rain due to its low topographic position. However, the soil moisture supply does exhibit great fluctuations as a result

of its location on the floodplain. It may vary from submergence during flood times to nearly xeric conditions during the river's mid-summer low stage. The Fisher Series soils characteristic of the riverbottom forests in Beaudry Park although a result of conditions of high soil moisure and intermittent floods, also contribute to provide the high soil moisture supply favoured by the riverbottom species. These soils discussed in a previous section, exhibit very little horizon development due to periodic inundation and slow interal soil drainage due to the high water table of the area and its own slowly permeable layers of silty clay and silty clay loam.

As a function of its location on floodplains and other areas of restricted drainage, the riverbottom forests of Beaudry Provincial Park exhibit a high degree of preservation in this agricultural section of Manitoba. Although these lands were not converted to cropland due to their probability of being flooded, sections of the riverbottom forests of Beaudry Park were used for grazing, logging and recreation in the past.

The report, "A Study into the Impacts of Existing and Past Uses in the Riverbottom Forest of Beaudry Provincial Park" (Simonson, 1976) indicates that the Beaudry riverbottom forest is in the most natural condition found in the park. The Sair riverbottom forest was found to be healthy but in an unnatural condition as a result of recreational use and logging from 1920 to 1940 and subsequent burning of the forest of southern portion of the peninsula, selective logging throughout the forest, and grazing in a northern portion of the forest. The Jail riverbottom is the most disturbed of the three riverbottom forests located on a meander peninsula as a result of heavy logging in the 1920's and 30's and subsequent use for selective logging and grazing.

D.1.2 Aspen Forest

Aspen forest is restricted to approximately twenty acres of

the Beaudry Property. Although the existence of large tracts of aspen forest is limited in Beaudry Provincial Park, small isolated pockets of trembling aspen do occur. Some of these pockets are located where the species' ideal growing conditions (well-drained, fine-textured loams and persistent groundwater) occur, whereas others occur in areas of previous disturbance such as logging and indicate the colonizing characteristic of this species.

The tract of aspen forest found in the Beaudry property like the riverbottom forest occurs in an area of low topography on the floodplain and an area exhibiting Fisher Series soils. The physiographic and soil characteristics of this area indicate that this area was once covered with riverbottom forest. In fact, this was the case. In the 1920's, heavy logging in this portion of the Beaudry property resulted in the removal of oak, ash, maple and poplar (Simonson, 1976). Trembling Aspen here is therefore, a nurse tree and the area may return to its previous riverbottom state. Since trembling aspen does not become established in frequently flooded bottomlands its presence here indicates that the area is inundated only in those years of very high water levels in the Assiniboine River.

D.1.3 Oak Forest

Bur oak forests are much more extensive than those of trembling aspen (see Map 7). The most extensive oak forest comprises a section of the Beaudry property.[1] This area is in a relatively high topographic position and corresponds to the area of Beaudry Provincial Park mapped as exhibiting soils of the St. Norbert series. These deep, well-

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[1] Only this bur oak forest is discussed as it is the most extensive and was sampled during the vegetation inventory conducted.

drained soils provide favourable conditions for the growth of bur oak. This area of bur oak forest exhibits little disturbance other than an overgrown linear clearing which had been created by a railway line. The forest is divided by an active streambed and a semi-active streambed.

D.1.4 Tall Grass Prairie

Although related to the current use of a large portion of Beaudry Provincial Park for cropland, the limited development and distribution of tree communities other than those of the riverbottom forests would have also occurred had this area been left untouched. This is a function of the park's partial location in the Grassland formation of the Great Plains of Canada. The sites which do favour tree growth rather than prairie growth have been described by Watts as follows:

"1. sites of locally moist atmospheric conditions due to higher altitude resulting in lower summer temperatures and moisture effectiveness,

2. sites of locally humid soils or soils with more than regionally normal moisture such as found in northeast exposures of hills, ravines and river flats,

3. in snowtraps, such as depressions and ravines,

4. in low spots in the prairie where run-off collects and where the water table is higher, and

5. sandy areas with moist substrata." (1969:105-106).

Had Beaudry Park been undisturbed by man, the numerous areas which exhibit humid soils and depressions would have supported tree growth, and the remainder of the park's area would have been covered by true prairie. Today, small areas of prairie in various degrees of quality are scattered throughout the southern portions of the Beaudry Property.

The best examples of this once widespread landscape type are a small triangular region close to the western shore of the retention pond located in the southern portion of the Beaudry Property and the combined width (approximately 110 feet) of two rights of way previously owned by Canadian National Railways and Manitoba Highways lying south of Route 241 extending from River Lots 7 and 8 to 19 (Parish of St. Francois Xavier). A study of the second area documented the presence of the big bluestem type Prairie and the porcupine grass - big bluestem type Prairie (Levin and Keleher, 1969).

D.2 Results of the Vegetation Inventory

D.2.1 Composition and Structure of the Riverbottom Vegetation Type

D.2.1.1 Tree Strata

Riverbottom Vegetation Type

The number of trees, number of trees per diameter size classes[1] total basal area, relative frequency, relative density, relative vegetation type tree strata are given in Table 6. The location of each sample plot established in this vegetation type (42 in total) is shown in Map 15. The number of trees, trees per hectare, total basal area, relative density, relative dominance and importance values for each species in each sample plot as well as the average height of the canopy are provided in Appendix I. Table 6 shows that green ash attains the highest importance value (IV) in the riverbottom vegetation type of Beaudry Provincial Park. Basswood, American elm, Manitoba maple, bur oak and cottonwood follow in importance,[2] respectively. Green ash, basswood, American elm and Manitoba

[1] The diameter size classes limits follow those of James and Shugart (1970).

[2] Importance is synonomous to ecologically dominant.

Table 6. The Number, Total Basal Area, Relative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Riverbottom Vegetation Type of Beaudry Provincial Park

Species*	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	38-53	53-69	69-83	83	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Green Ash	41	259	117	56	17	2				451	10.11	25	41	20	86
Basswood	29	52	53	63	43	32	8			251	15.52	18	23	31	72
American Elm	32	50	29	40	26	18	5	3	2	173	12.31	19	16	25	60
Manitoba Maple	38	48	56	30	22	6				162	5.36	23	15	11	49
Bur Oak	21	16	10	10	5	7	2			50	3.03	13	4	6	23
Cottonwood	4	2				1	1	1	3	8	3.45	2	1	7	10
								Total		1095	49.78	100	100	100	300

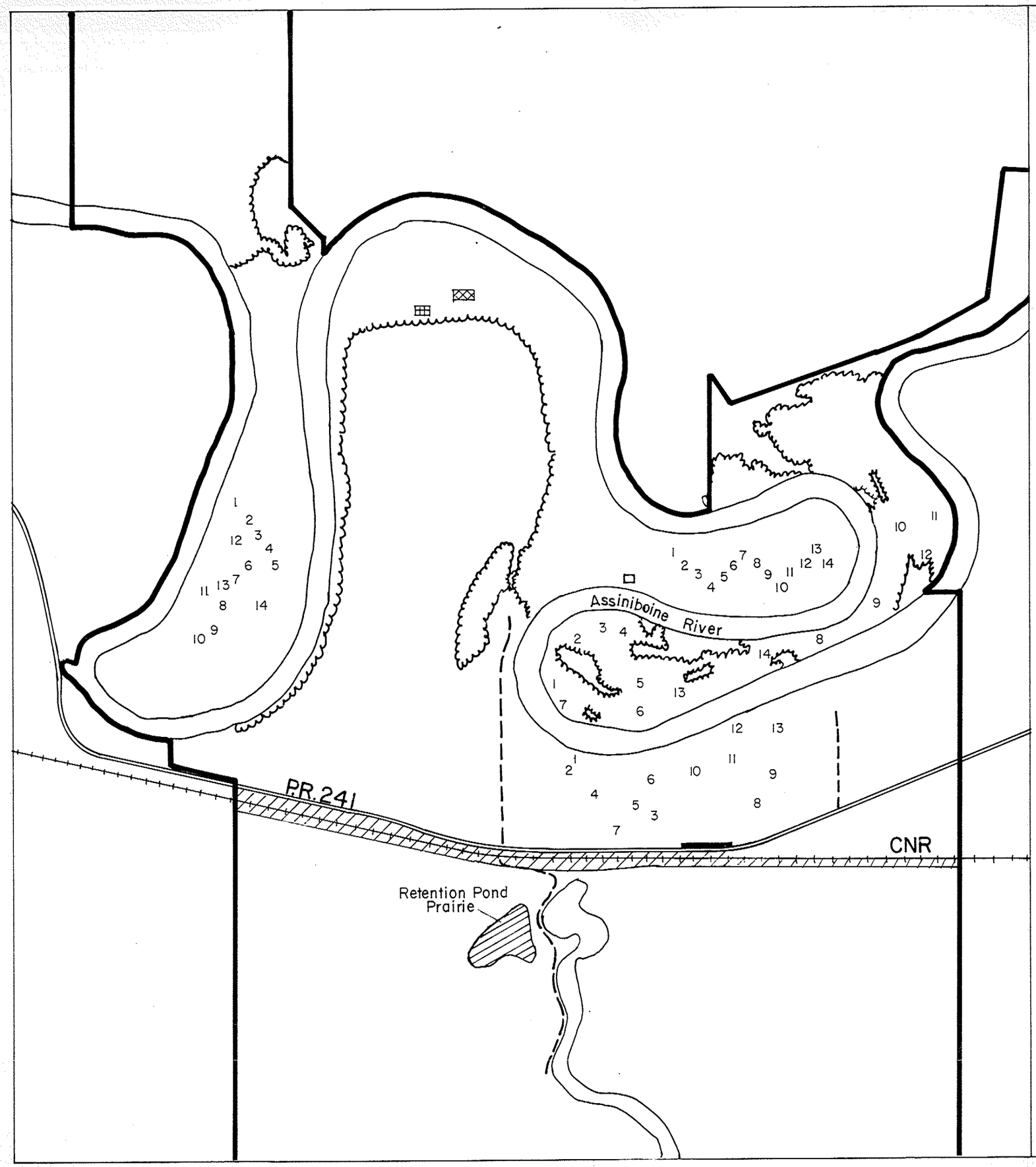
[a] A total of forty-two sample plots were taken.
[b] The diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).
*One Nannyberry tree was sampled, however its low basal area resulted in its exclusion from the above determination of Importance Value per species.

MAP 15

The location of vegetation sampling plots in Beaudry Provincial Park and areas supporting rare plant species

Numbers - Sample plots

- True Prairie
- Location of Gentian
- Location of Indian Pipe
- Location of Rattlesnake Fern
- Location of Spotted Corralroot



- Limit of Park Lands
- Unpaved Roads

NORTH

100 0 500 1000
metres

maple the most important tree species of this riverbottom forest, occur with approximately equal relative frequency throughout this vegetation type. The high importance value of green ash is a function of its high value for relative density. An examination of the number of trees per diameter size class shows that the majority of these individuals are found in the lowest diameter size class (8-15 cm.) with a large number of trees also found in the second diameter size class (15-23 cm.) Only two individuals were sampled which were greater than 38 cm. in diameter at breast height. Since the majority of the green ash individuals (those in the lower diameter size classes) have not reached maturity,[1] it seems likely that green ash will remain the dominant species in the riverbottom forest if environmental conditions closely approximate those of the past.

Although green ash has the highest importance value, both basswood and American elm exhibit a higher total basal area.[2] Basswood, exhibiting the highest total basal area (15.52 m^2), was followed by American elm (12.31 m^2). Thus, even though twice as many individuals of green ash were enumerated than basswood or American elm, the relative dominance is higher for basswood and American elm that green ash. This is the result of the greater diameter that both basswood and American elm may obtain. Since dbh for basswood ranges from 46 cm. to 76 cm. at maturity, the data for the diameter size class in Table 6 indicates that the majority of the basswood present in this riverbottom forest have not reached maturity. The large number of young basswood may indicate that this species may become more important in the future. At maturity American elm grows to a

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[1] Typically mature green ash range from 8-38 cm. in diameter at breast height; in good sites dbh may reach 61 cm. (2 feet).

[2] Although not used in this study, basal area is a frequently used measure of ecological dominance in forest situation (Shimwell, 1971). Had total basal area been used in this study, results would have differed significantly.

diameter at breast height of 30 cm. to 61 cm.[1] Although a greater proportion of the total of individual elms have reached maturity than basswood, a significantly large proportion of the total has not yet reached maturity. This may indicate that elm like basswood, may contribute more to the riverbottom forest community in the future. A number of very large American elms (greater than 69 cm.) were also sampled. Their presence seems to indicate that their specific location provides optimum growing conditions for the species.

Manitoba maple attains one of the lowest importance values in the riverbottom forest. Although the relative frequency is close to that of green ash, the relative density and relative dominance indicate that Manitoba maple plays a secondary role wherever it does occur.

The importance value of bur oak for this riverbottom community is low. This is not an unexpected result since bur oak is more common in upland (better drained) sites. However, bur oak is not an uncommon species in a riverbottom community since this species grows best on deep soils in rich bottomlands (Hosie, 1975).

Cottonwood has the lowest importance value. The large diameter of this species has resulted in its large relative dominance in comparison to other species which have a similar relative dominance but a much larger complement of individuals, i.e., bur oak. Although comparatively few cottonwoods do occur their occurrence is localized (on the downstream edge of the meander peninsulas). As a result, their biological contribution to the total riverbottom vegetation type is restricted to specific locations.

The preceding discussion has given some indication of the general

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[1] American elm may grow to 91-122 cm. at breast height (Hosie, 1975).

composition and structure of Beaudry Park's riverbottom forest. Since land use in each of the areas of riverbottom forest sampled in Beaudry Park varied in the past the tree strata of each will be discussed separately. Tables 7, 8 and 9 summarize the data obtained from the sample plots carried out in the Beaudry, Sair and Jail Riverbottom forests respectively. (See Appendix I for the data obtained in each sample plot.).

Beaudry Riverbottom Forest

In the Beaudry riverbottom forest, green ash is the most important species (IV = 100). It is followed by basswood and American elm which are equal in importance value (IV = 59), then by Manitoba maple, bur oak and cottonwood (see Table 7). The high importance value for green ash was expected from the previous discussion which indicates that green ash is the ecologically dominant tree species in Beaudry Park's riverbottom forest. Again, green ash did not exhibit the highest relative dominance, and its high importance value is a function of its high relative density. Basswood and American elm have approximately equal total basal areas (4.6 m^2 and 4.3 m^2 respectively). These species differ in their relative frequency and relative density; the significant difference lies in the values for relative density. Although there are more basswood trees, these occurred in only 58% of the sample plots whereas American elm occurred in 78% of the sample plots taken. In comparison to the riverbottom community type as a whole, in which the relative frequency of basswood was close to that of elm, the data for Beaudry riverbottom forest indicates that basswood is less widely distributed and occurs in greater densities than elm when it is present. Although only two cottonwoods occurred in the sample plots taken, a row of cottonwoods of very large diameter (greater than 69 cm.) occur on a portion of the southern edge

Table 7. The Number, Total Basal Area, Relative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Beaudry Riverbottom Forest.

Species*	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	38-53	53-69	69-83	83	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Green Ash	13	153	43	11	5					212	3.50	24	55	22	101
Basswood	8	18	7	12	12	11	3			63	4.60	15	16	29	60
American Elm	11	6	9	12	12	5	2	1	1	48	4.30	20	12	27	59
Manitoba Maple	13	24	6	2	1					38	0.85	24	10	5	38
Bur Oak	9	7	5	4	3	2	2			23	1.70	16	6	11	33
Cottonwood	1							1	1	2	1.02	2	1	6	9
								Total		386	15.97	101	99	100	300

[a] A total of fourteen sample plots were taken.
[b] The tree diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).
* One Nannyberry tree was sampled, however its low basal area resulted in its exclusion from the above determination of Importance Value per species.

of the Beaudry peninsula. One nannyberry occurred in the Beaudry riverbottom forest.

Sair Riverbottom Forest

In contrast to the Beaudry riverbottom forest, Table 8 shows that in the Sair riverbottom forest green ash and American elm are the ecological dominants. Each species has an importance value equal to 81. Basswood, Manitoba maple, bur oak, and cottonwood follow in ecological importance. The importance values for these species are very close to those found for the Beaudry forest. The total basal area of the tree species of Beaudry riverbottom forest (15.97 m^2) is close to the total basal area of the Sair riverbottom forest (16.1 m^2). This result is expected since the total basal area of the tree species growing under similar environmental conditions frequently assumes a similar figure in different stands (Shimwell, 1971). The difference between the Beaudry and Sair riverbottom forests lies in the low importance of ash (Δ IV = 19), and the much higher importance of American elm (Δ IV = 22), in the Sair forest. The high importance value for American elm is the result of its high values for relative dominance and relative density (compared to the Beaudry riverbottom forest). The most significant feature is the large increase in the number of elm from that found in Beaudry; the greatest increase in number is found in the lowest diameter size class. This may be an indication that American elm will continue to be more ecologically dominant than basswood in the Sair riverbottom forest. The lower IV for green ash is the result of the lower relative density for green ash. In Sair, only one hundred and thirty-four (134) trees occurred in the sample plots whereas two hundred and twelve occurred in the Beaudry riverbottom forest.

Table 8. The Number, Total Basal Area, Relative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Sair Riverbottom Forest.

Species	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	38-53	53-69	69-83	>83	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Green Ash	14	75	39	15	3	2				134	3.1	25	37	19	81
American Elm	12	42	14	17	10	9	2	1	1	96	5.4	21	26	34	81
Basswood	10	16	9	22	13	7	2			69	4.1	17	19	25	61
Manitoba Maple	12	12	17	9	4	1				43	1.5	21	12	9	42
Bur Oak	8	8	3	6	2	4				23	1.1	14	6	7	27
Cottonwood	1								1	1	0.9	2	<1	6	8
								Total		366	16.1	100	100	100	300

[a]A total of fourteen sample plots were taken.
[b]The tree diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).

Jail Riverbottom Forest

In contrast to the Sair and Beaudry riverbottom forests, Table 9 shows that basswood has the highest importance value (IV = 94) and therefore is the dominant tree species in the Jail riverbottom forest. Basswood is followed in importance value by green ash, Manitoba maple, American elm, cottonwood and bur oak. The high importance value of basswood is a result of a high relative dominance and relative density. In the Jail riverbottom forest sample plots, one hundred and nineteen (119) basswood trees were enumerated whereas only sixty-nine (69) and sixty-three (63) were enumerated in the Sair and Beaudry riverbottom forests respectively. In addition the total basal area of basswood is significantly higher than in the Beaudry and Sair forests (6.82 m^2 in comparison to 4.6 m^2 and 4.1 m^2). The Jail riverbottom forest has the lowest number of green ash encountered in the three riverbottom forests sampled, yet the total basal area of green ash approximates that of the Beaudry and Jail forests. This is a result of the difference in structure of the green ash population; instead of a majority of green ash trees occurring in the lower diameter size classes, in the Jail forest, a much greater number of the trees occur in the larger diameter size classes (greater than 30 cm. dbh). Another significant feature of the Jail riverbottom forest is the high importance value of Manitoba maple. This is the result of a greater number of maple trees (84 compared to 38 and 43 in the Beaudry and Sair forests respectively) and the low occurrence of individuals in the lowest diameter size class. The larger diameter of the Manitoba maple trees found in the Jail riverbottom forest has resulted in the high relative dominance of this species. American elm attains a surprisingly low importance value (IV = 40). It is a function of the small number of elm which occurred in the sample plots. Opposite to the situation typical to

Table 9. The Number, Total Basal Area, Relative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Jail Riverbottom Forest.

Species	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	38-53	53-69	69-83	>83	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Basswood	11	31	35	30	9					119	6.82	21	35	38	94
Green Ash	14	18	37	29	18	14	3			105	3.51	26	31	20	77
Manitoba Maple	13	33	16	16	4					81	3.01	24	24	17	65
American Elm	9	2	6	11	4	4	1	1		29	2.61	17	8	15	40
Cottonwood	2	2			1			1	1	5	1.53	4	1	9	14
Bur Oak	4	1	2			1				4	0.23	8	1	1	10
								Total		343	17.7.	100	100	100	300

[a] A total of fourteen sample plots were taken.
[b] The tree diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).

the Beaudry and Sair forests and similar to that for green ash and Manitoba maple, in the Jail forest, there are fewer individuals of American elm found in the lowest diameter size class. Another feature of interest in the Jail riverbottom forest is the low importance value for bur oak (IV = 10). In contrast to the situation in the Beaudry and Sair forests, only four bur oak trees occurred in the sample plots. Although the importance value of cottonwood is approximately equal to that found for the other two riverbottom forests, the total number of cottonwoods which occurred is greater (five compared to two in the Beaudry forest plots and one in the Sair forest plot). In addition two of the cottonwoods enumerated belong to the lowest diameter size class. The total basal area of the tree species for the Jail riverbottom forest is 17.71 m^2. This is significantly higher than the average of the total basal area for the Beaudry and Sair riverbottom forests (16.04 m^2).

Since the Jail riverbottom forest exhibits fewer trees (343) compared to the Beaudry and Sair forests (386 and 366 respectively), the greater total basal area could be attributed to the greater diameters of most of the tree species occurring in the Jail forest.

D.2.1.2 Shrub Strata

Tables 10, 11 and 12 give the number of all species of shrubs[1] sampled in each plot, the total number of stems per sample plot, the total number of stems in the fourteen sample plots, stems per hectare, relative density, relative frequency and the importance value for each shrub species sampled in the Beaudry, Sair and Jail riverbottom forests. Table 13 lists the shrub species sampled in the riverbottom vegetation type. The shrub strata of each forest will be discussed separately. This will

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[1] Shrubs here include lianas.

be followed by a comparative review of the shrub strata in the three sample areas.

Beaudry Riverbottom Forest

Table 10 shows that green ash attains the highest importance value and therefore, is the ecologically dominant shrub species in the Beaudry riverbottom forest. Hazelnut attains the second highest importance value and is of secondary importance in the forest as a whole. Red Osier Dogwood, riverbank grape, Manitoba maple, and basswood follow in importance respectively. The remainder of the shrubs; American elm, nannyberry, bittersweet, bur oak and highbush cranberry occurred infrequently throughout the sample plots and thus, exhibit a very low importance value. The high importance value for green ash is a result of its greater relative frequency of occurrence. Hazelnut attains a higher relative density level. Thus, green ash is widely distributed throughout the forest whereas hazelnut is more localized in occurrence and is usually concentrated in thickets when it does occur.

Sair Riverbottom Forest

Table 11 shows that hazelnut is the ecologically dominant shrub species in the Sair forest. Its importance value is much higher than the next most important shrub species: green ash. Moonseed, American elm, and trembling aspen, follow in importance respectively. Red osier dogwood, Manitoba maple, nannyberry, basswood and cottonwood attain a low importance value (i.e., less than 10) and are of lesser importance. Again, the relative frequency of green ash is higher than that of hazelnut which was recorded in only five of fourteen sample plots. However, the relative density of green ash is less than that of hazelnut. The stems per hectare for green ash was calculated and equals 6,425 whereas this measure is 24,463 (stem/hectare) for hazelnut. Hazelnut usually occurred in dense thickets.

Table 10. The Number of Shrub Stems of Each Shrub Species Sampled in Each Sample Plot, the Total Number of Shrub Stems, Stems per Hectare, Relative Density, Relative Frequency, and Importance Value of Each Shrub Species Sampled in the Beaudry Riverbottom Forest.

Shrub Species *	Number of Shrub Stems per Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total Number of Shrub Stems	Stems/ Hectare	Relative Density (D)	Relative Frequency (F)	Importance Value (D+F)
Green Ash	2	2	2	1		5	29	5	8	4	6	10	15	8	97	23969	33	26	59
Hazelnut	8	16	23	18	35	5		4							109	26934	37	16	53
Red Osier Dogwood	2	2	4	1							14	9			32	7907	11	12	23
Riverbank Grape		1	1								10	8	6	1	27	6671	9	12	21
Manitoba Maple			1		1	1				3	1			1	8	1976	3	12	15
Basswood			1	1		1					3				6	1483	2	8	10
American Elm		1										2			3	741	1	4	5
Nannyberry					1			2							3	741	1	4	5
Bittersweet										1	1				2	494	1	4	5
Bur Oak					2										2	494	1	2	3
Highbush-Cranberry												2			2	494	1	2	3
Total	12	22	32	21	39	12	29	11	8	8	35	31	21	10	291	71904	100	102	202

* In this study Shrub species included woody lianas.

Table 11. The Number of Shrub Stems of Each Shrub Species Sampled in Each Sample Plot, the Total Number of Shrub Stems, Stems per Hectare, Relative Density, Relative Frequency, and Importance Value of Each Shrub Species Sampled in the Sair Riverbottom Forest.

Shrub Species*	Number of Shrub Stems per Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total Number of Shrub Stems	Stems/ Hectare	Relative Density (D)	Relative Frequency (F)	Importance Value (D+F)
Hazelnut*	16	35	3								36	9			99	24463	62	18	80
Green Ash		2		3	1		5		5	5		2	1	2	26	6425	16	26	42
Moonseed				2	1	2		2		3		1		1	12	2965	7	20	27
American Elm										2		2		1	5	1236	3	8	11
Trembling Aspen					1	5									6	1483	4	6	10
Red Osier Dogwood	3									1					4	988	2	6	8
Manitoba Maple				1					2						3	741	2	6	8
Nannyberry								2	1						3	741	2	6	8
Basswood	1											1			2	494	1	2	3
Cottonwood												1			1	247	1	2	3
Total	20	37	3	5	4	7	5	4	8	11	36	16	1	4	161	39783	100	100	200

*The number of Hazelnut shrub stems includes the number of Beaked Hazelnut and American Hazelnut stems sampled.
*In this study Shrub species included woody lianas.

Jail Riverbottom Forest

Table 12 shows that hazelnut is the most important shrub species (IV = 50) in the Jail riverbottom forest. American elm, green ash, basswood, and Manitoba maple follow in ecological dominance. Each of these shrub species attains a share in range of importance values (IV ranges from 35 for American elm to 27 for Manitoba maple). The remaining shrubs, nannyberry, moonseed, and Saskatoon follow in importance respectively. American elm, green ash, basswood and Manitoba maple attained a higher relative frequency than hazelnut. Although these species were more widely distributed throughout the Jail forest, the number of individual stems counted and thus, the relative density, was small in comparison to hazelnut. The total number of stems of hazelnut counted in the Jail forest is very low (28) when compared to the Beaudry (109) and Sair (99) riverbottom forests. Hazelnut also occurred in four of the fourteen sample plots and rarely occurred in dense thickets.

Comparative Review of Shrub Strata Data

A total of sixteen shrubs species were sampled in the riverbottom vegetation type (see Table 13). The Beaudry forest exhibited thirteen, the Sair forest eleven and the Jail forest, eight. Of the sixteen shrub species two species (trembling aspen, Saskatoon) are considered alien to a riverbottom forest shrub strata. Beaudry riverbottom forest has the most diverse and natural shrub strata[1] (Beaudry exhibits thirteen of the fourteen shrub species characteristic of the riverbottom forest of Beaudry Provincial Park). In addition the Beaudry riverbottom forest exhibits the greatest number of shrubs stems per hectare (71,904 stems/hectare compared to 39,783 stems/hectare in the Sair forest and 18,286 stems/hectare in the Jail forest).

[1] Natural here means distinguished by exhibiting only those shrub species characteristic of mature riverbottom forests.

Table 12. The Number of Shrub Stems of Each Shrub Species Sampled in Each Sample Plot, the Total Number of Shrub Stems, Stems per Hectare, Relative Density, Relative Frequency, and Importance Value of Each Shrub Species Sampled in the Jail Riverbottom Forest.

Shrub Species *	Number of Shrub Stems per Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total Number of Shrub Stems	Stems/ Hectare	Relative Density (D)	Relative Frequency (F)	Importance Value (D+F)
Hazelnut*			10		2						3			13	28	6919	38	12	50
American Elm	6	1							1	1		2			11	2718	15	20	35
Green Ash		2	2						1			2	1		8	1977	11	20	31
Basswood		1		2				2		4					9	2224	12	16	28
Manitoba Maple									1		1		4	2	8	1977	11	16	27
Nannyberry								3						3	6	1483	8	4	12
Moonseed								2	1						3	741	8	4	12
Saskatoon								1							1	247	1	4	5
Total	6	4	12	2	2			8	4	5	4	4	5	18	74	18286	100	100	200

*The number of Hazelnut shrub stems is the sum of the number of Beaked Hazelnut and American Hazelnut stems sampled.
*In this study shrub species included woody lianas.

Table 13. The Shrub and Liana Species Sampled in the Riverbottom Vegetation Type of Beaudry Provincial Park

Shrub Species	Liana Species
Beaked Hazelnut	Riverbank Grape
American Hazelnut	Moonseed
Green Ash	Bittersweet
Trembling Aspen	
Red Osier Dogwood	
Manitoba Maple	
Nannyberry	
Basswood	
Cottonwood	
Bur Oak	
Saskatoon	
High-Bush Cranberry	

* A total of sixteen (16) shrubs and lianas were sampled.

Hazelnut reaches the highest relative density in all three areas. In all cases hazelnut occurs as thickets in areas of disturbance or in areas bordering the river's edge usually on the cut-off bank. Riverbank grape and bittersweet were restricted in occurrence to the Beaudry river-bottom forest where they were concentrated further inland in those areas of the forest which had received minimal disturbance from man's activities. In addition, riverbank grape and bittersweet usually occurred in those sample plots in which green ash attained the highest importance value of the tree species present. Moonseed, the other liana, listed in Table 13 did not occur in the Beaudry forest, however, it was present in both the Jail and Sair riverbottom forests. Moonseed, with an importance value of 27 was the third most important species in the shrub strata of the Sair riverbottom forest, however it was only of minor importance in the Jail forest. Red osier dogwood was most common in the Beaudry riverbottom forest. Very few examples of this species occurred in the Sair forest and it did not occur in the Jail forest. The red osier dogwood was usually found in higher and therefore, better drained sites close to those edges of the river which exhibit a steep cut-off bank. Although the stems per hectare for Manitoba maple is very close in the Jail and Beaudry forests, this species attains a higher importance value in the Jail forest.[1] The biological contribution of Manitoba maple in the Sair forest is low. Basswood is of low importance in all three forests, but is especially low in importance in the Sair riverbottom forest. American elm like basswood does exhibit a significantly high importance value in the Sair and Beaudry forests. However, it is the second most important shrub species in the Jail forest.

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[1] The importance of Manitoba maple in the shrub strata is probably related to the relatively high importance value for this species in the tree strata.

The presence of trembling aspen in the shrub layer of the Sair forest is not totally unexpected since a small portion in the centre of the Sair meander peninsula exhibits a trembling aspen dominant stand of forest. The presence of Saskatoon in the Jail forest shrub understory probably is the result of transmission by wind.

By way of summary, hazelnut and green ash combine as the most dominant shrub species in the riverbottom forests studied with the exception of the Jail forest. Green ash is widely distributed in the Beaudry and Sair forests (although more so in the Beaudry forest) and hazelnut is found to occur in thickets in relatively specific locations. Beaudry riverbottom forest exhibits the greatest number of shrub stems per hectare, diversity in shrub species and complement of lianas.

D.2.1.3 Groundcover Strata

Tables 14, 15 and 16 give the average cover value for each herb species sampled in each sample plot, the average cover value for each herb species per the areas sampled, and the relative cover value (Importance Value) for each herb species sampled in the Beaudry, Sair and Jail riverbottom forests respectively.

Beaudry Riverbottom forest

Table 14 indicates that the Beaudry riverbottom forest is characterized by high relative cover value for ostrich-fern, poison ivy, and sarsaparilla. Riverbank grape, virginia creeper, moonseed and green ash are of secondary importance. These species compose the uppermost level of the groundlayer. The lower layer of the ground cover is composed of sweet-scented bedstraw, dewberry, false Solomon's Seal and wild lily-of-the valley. These species are widely distributed in the forest's lower ground cover layer (i.e., occur in the majority of quadrats thrown in the sample plot) but do not attain a high relative cover value due to the small

Table 14. The Average Cover Value for Each Herbaceous Species Sampled in Each Sample Plot, and the Average Cover Value and Relative Cover Value of the Herbaceous Species Sampled in the Sample Plots Located in the Beaudry Riverbottom Forest.

	Average Cover Value[b] in Sample Plot Number														Average Cover Value for all Sample Plots	Relative Cover Value
	1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Ostrich-Fern	1.15	0.80	1.30	0.65	1.30	1.20	0.05	2.80	2.00	1.85	1.80	1.20	3.15	0.80	1.43	20
Poison Ivy	1.50	1.30	1.10	1.05	1.70	1.25	0.90	1.10	0.90	1.25	1.25	1.50	0.55	0.35	1.12	16
Wild Sarsaparilla		1.85	1.15	1.75		2.20		1.30				0.65	0.05	2.80	0.84	12
Riverbank Grape	0.20	0.45	0.75	0.50	0.30	0.20	0.45	0.45	0.35	0.50	0.60	1.50	0.40	0.35	0.15	7
Virginia Creeper	0.40	0.30	0.45	0.25	0 45	0.55	1.00	0.10	0.25	0.05	0.60	0.25	0.70	0.15	0.39	5
Moonseed	1.95	0.55	0.60	1.05	1.10		0.25								0.39	5
Green Ash	0.40	0.50	0.30	0.25	0.30	0.15	1.70	0.05	0.10		0.10	0.20	0.60	0.35	0.36	5
Meadow-Rue	0.75	0.45	0.10	0.55	0.30	0.15	0.35	0.25	0.15	0.30	0.20	0.35	0.05		0.28	4
Sweet-Scented Bedstraw	0.05	0.10	0.05	0.25	0.20	0.05	0.30	0.45	0.85	0.55	0.15	0.05	0.10	0.25	0.24	3
Beaked Hazelnut	0.55	0.45	0.35	0.25	0.40	0.20	0.15	0.10	0.05	0.15	0.15	0.15		0.45	0.24	3
Hedge Nettle	0.10	0.30	0.25	0.30	0.30		0.85	0.10	0.30	0.10	0.05				0.19	3
Dewberry	0.25	0.10	0.05	0.15	0.15				0.10	0.55	0.25		0.05		0.18	3
Starry False Solomon's Seal	0.30		0.15	0.10	0.10	0.10	0.35	0.15	0.05	0.05	0.40	0.10	0.05	0.20	0.15	2
Wild Lily-of-the-Valley	0.30	0.25	0.20	0.05	0.40		0 05	0.10	0.15		0.40	0.10	0.05	0.15	0 13	2
Basswood		0.15	0.50	0.15			0.15	0.20		0.15				0.10	0.10	1
Horsetail	0.15							0.10	0.15	0.65	0.10	0.10		0.05	0.09	1
Bur Oak	0.10	0.40	0.20	0.15	0.10	0.05			0.05	0.05	0.05				0.08	1
Carrion Flower	0.10	0.30		0.05	0.05	0.10	0.10	0.10	0.05	0.10		0.05		0.05	0.08	1
Hog-Peanut	0.25	0.05		0.35						0.25					0.06	1
Red Osier Dogwood	0.15		0.15			0.05	0.20		0.05		0.15	0.15			0.06	1
Wood Nettle					0.40		0.25					0.10			0.05	1
Bittersweet								0.05	0.15		0.35				0.04	1
Manitoba Maple		0.05	0.10	0.10		0.10	0.15							0.05	0.04	1
															Total	99

[a]Additional herbs sampled were American Hazelnut, Red Raspberry, American Elm, Highbush Cranberry, Rose, Wild Black Currant, Nodding Trillium, Willow, Stickseed, and Three Leaved False Solomon's Seal. Their low Cover Values resulted in their exclusion from the calculation of their Relative Cover Value.

[b]This value is the average of the cover values assigned in each of the twenty 1 m^2 quadrats thrown in each sample plot.

aerial growth of these plants. The remaining species which contribute to the groundlayer of the Beaudry forest are of low importance (relative cover less than 5) and are presented in Table 13. The occurrence of a variety of lianas in Beaudry forest is worthy of note. These include poison ivy, sarsaparilla, riverbank grape, virginia creeper, moonseed, carrion flower, hog peanut and bittersweet. The sum of the relative cover values for these species is 32; therefore, lianas could be considered the dominant influence in this riverbottom forest.

Sair Riverbottom Forest

Table 15 shows that in the Sair riverbottom forest, poison ivy, moonseed, woods nettle, and ostrich-fern are the most important ground cover species. Riverbank grape and virginia creeper are of secondary importance. Although the groundcover of Sair forest also consists of two layers, the lower layer is much less developed than it is in the Beaudry Forest. Thus, although false Solomon's Seal, wild lily-of-the-valley, and dewberry occur in a number of the quadrats, they do so in very low numbers. This may be the result of the dominance of poison ivy, moonseed, woods nettle, and ostrich-fern. Together the relative cover values of these species is 72 (i.e., greater than 70% of the total). The high density of these species may restrict the nutrients, ie., sunlight and soil moisture available to the lower level ground cover species. The high relative cover for woods nettle is worth mentioning since it is higher than that of ostrich-fern and is in contrast to the situation in the Beaudry riverbottom forest. The remaining species contributing to the groundcover of Sair forest and their importance values are given in Table 15. The lianas which occur in this forest are poison ivy, moonseed, riverbank grape, virginia creeper, hog peanut and carrion flower. The sum of their relative cover values is 47 and therefore, they are the most important plants in this forest.

Table 15. The Average Cover Value for Each Herbaceous Species Sampled in Each Sample Plot, and the Average Cover Value and Relative Cover Value of the Herbaceous Species Sampled in the Sample Plots Located in the Sair Riverbottom Forest.

Species[a]	Average Cover Value[b] in Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Average Cover Value for all Sample Plots	Relative Cover Value
Poison Ivy	1.70	0.85	2.35	2.45	1.35	1.75	2.05				1.75	1.80	0.85	0.05	1.20	19
Moonseed	0.40	0.25	1.45	1.85	1.85	1.90	1.50	0.15	0.45	0.35	1.20	1.85	2.15	0.75	1.17	18
Wood Nettle			0.10	0.05	0.10	0.30	1.30	3.60	2.55	1.55	0.45	0.15	2.40	3.85	1.17	18
Ostrich-Fern	0.15	0.50	0.25	0.30	1.90	0.20	0.65	1.70	2.30	2.95	0.60	2.40	0.30	0.95	1.08	17
Riverbank Grape	0.60	0.15	0.15	0.15	0.05	0.45	0.15			0.10	0.75	0.50	0.35		0.24	4
Virginia Creeper	0.10	0.35	0.80	0.35	0.05	0.15	0.05		0.20		0.20	0.20	0.20		0.19	3
Beaked Hazelnut	0.20	2.10									0.10				0.17	3
Green Ash	0.10	0.20	0.10		0.25	0.30				0.10	0.20	0.15	0.20	0.15	0.13	2
Starry False Solomon's Seal	0.40	0.05	0.55	0.15	0.10	0.10				0.05	0.15	0.15			0.12	2
Wild Sarsaparilla	0.60	0.40				0.60					0.05				0.12	2
Meadow-Rue	0.30		0.20	0.15	0.10	0.10	0.10			0.05	0.20	0.05	0.15		0.10	2
Hog-Peanut	0.75		0.35		0.10	0.20									0.10	2
Hedge Nettle		0.05	0.30	0.10	0.25	0.20	0.10						0.15		0.09	1
Wild Black Currant			0.10	0.05	0.10	0.15				0.10	0.15	0.10	0.25	0.15	0.08	1
Sweet-Scented Bedstraw	0.30				0.25	0.10			0.15		0.15				0.07	1
Bur Oak	0.10		0.20	0.10	0.05		0.15			0.05	0.05				0.05	1
American Elm		0.15	0.05			0.25	0.05			0.15					0.05	1
Basswood						0.10	0.10				0.10	0.35	0.05		0.05	1
Wild Lily-of-the Valley	0.35	0.05	0.25												0.05	1
Carrion Flower	0.10			0.10	0.15	0.10	0.05		0.05			0.05			0.04	1
															Total	100

[a] Additional herbs sampled were Horsetail, Highbush Cranberry, Red osier Dogwood, Manitoba Maple, Dewberry, Saskatoon, Fringed Loosestrife, Rose, Goldenrod, and Nodding Trillium. Their low Cover Values resulted in their exclusion from the calculation of their Relative Cover Value.

[b] This value is the average of the cover values assigned in each of the twenty 1 m^2 quadrats thrown in each plot.

Jail Riverbottom Forest

Table 16 shows that ostrich-fern, moonseed and poison ivy attain the highest relative cover values and therefore, could be considered the dominant species in the ground layer of the Jail riverbottom forest. Canada anenome, wild sarsaparilla and meadow rhue, are of secondary importance. The remaining ground cover species are of low importance and are given in Table 16. The ground cover of the Jail forest rarely exhibits the two layer composition characteristic of the Beaudry forest. This is likely the result of the disturbance of this forest through selective logging carried out here in the past. A total of thirty-nine species were recorded as composing the ground layer of the Jail forest. This large number of species indicates a high species diversity for the ground cover of this forest, however, this number and its implications are misleading since many species recorded such as Canada anenome, snowberry, Canada thistle, common burdock, goldenrod, spiny-leaved sow thistle, green headed coneflower, and rose are not characteristic of a riverbottom forest. Instead the presence of these species gives a further indication of the disturbance of this forest by man.[1]

The sum of the relative cover values of the lianas present in the Jail forest (moonseed, poison ivy, sarsaparilla, virginia creeper, hog peanut and carrion flower and riverbank grape) is 20 and indicates that they are an important component of the ground layer of the Jail riverbottom forest.

Comparative Review of the Ground layer Strata

A total of forty-seven species were found to occur in the ground-

[1] Man was probably a vector which carried these species to the Jail riverbottom forest.

Table 16. The Average Cover Value for Each Herbaceous Species Sampled in Each Sample Plot, and the Average Cover Value and Relative Cover Value of the Herbaceous Species Sampled in the Sample Plots Located in the Jail Riverbottom Forest

Species[a]	Average Cover Value[b] in Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Average Cover Value for all Sample Plots	Relative Cover Value
Ostrich-Fern	1.75	1.35	3.25		0.25	0.45	2.05		0.75	3.20	0.80	1.05	1.10	0.45	1.18	14
Moonseed	1.40		0.40		0.55	2.65	1.25	0.60	1.70	1.80			1.40	0.90	0.90	10
Poison Ivy	0.50	0.15	0.15	0.20	0.35	1.40	0.40	0.35	1.10	2.15	0.55	1.45	1.30	1.05	0.79	9
Canada Anenome			0.10	0.35			0.15	1.05	2.20	0.65	0.30	1.35		0.45	0.47	5
Wild Sarsaparilla	2.00	1.20	0.65	0.15	0.65		0.55						0.95		0.44	5
Meadow-Rue	0.10	1.35	0.15	1.00	0.05			0.40		0.35	0.65	1.55	0.20	0.10	0.42	5
American Elm	0.20	0.70	0.95	0.50	0.15		0.20	0.10	0.35			1.30	0.05	0.85	0.38	4
Wood Nettle	0.15	0105	0.05	0.25	2.70	0.15	0.15	0.15					0.15	1.30	0.36	4
Green Ash	0.05	0.80	0.80	0.10		0.05	0.10	0.25	0.20	0.25	0.70	1.55		0.20	0.36	4
Virginia Creeper	1,15	0.55	0.40	0.40	0.65	0.35	0.95	0.20						0.20	0.35	4
Hog-Peanut								0.15	0.50	0.40	2.05	0.15	0.30		0.25	3
Wild Lily-of-the Valley	0.25	0.90	0.15	0.05			0.15	0.25		0.25	0.50		0.75	0.30	0.25	3
Riverbank Grape	0.65				0.05	0.20		0.05		0.50	0.20	1.10	0.25	0.40	0.24	3
Snowberry		0.85	0.20	0.25	0.05			0.45	0.20	0.30	0.10	0.50	0.05	0.45	0.24	3
Starry False Solomon's Seal	0.25	0.80	0.10	0.05		0.05	0.15	0.90	0.25	0.20		0.05	0.05	0.55	0.24	3
Hedge Nettle		0.15		0.45	0.05		0.20	0.15	0.90	0.10	0.35	0.25	0.15	0.20	0.21	2
Canada Thistle			0.05					0.30	0.10	0.70	0.10	0.50	0.15		0.17	2
Sweet-Scented Bedstraw	0.15	0.25		0.45	0.05		0.30	0.05	0.40	0.10		0.25	0.05	0.20	0.16	2
Manitoba Maple		0.30		1.30					0.30	0.20				0.05	0.15	2
Grasses	0.35	0.90		0.50	0.40		0.05		0.25	0.25		0.25	0.10	0.55	0.14	2
Basswood		0.10								0.70	0.80		0.05	0.10	0.12	1
Wild Black Currant	0.35	0.30		0.10		0.20	0.30						0.40	0.05	0.12	1
Common Burdock		0.15	0.20	0.45				0.30	0.75	0.10					0.11	1
Goldenrod (sp)								0.50		0.20	0.25	0.30		0.10	0.10	1
Nodding Trillium		0.25		0.65		0.05							0.05		0.07	1
Carrion Flower	0.10	0.20	0.10	0.10		0.05			0.10	0.10		0.05	0.10	0.05	0.07	1
Spiny-Leaved Sow Thistle		0.20	0.05	0.25				0.05	0.05			0.05			0.05	1
Green-Headed Coneflower				0.20			0.10				0.25			0.15	0.05	1
Rose								0.15		0.10	0.15			0.30	0.05	1
															Total	98

[a] Additional herbs sampled were Stickseed, Slender Nettle, Lopseed, Hedge Bindweed, Strawberry, Raspberry, Chokecherry, Horsetail, Wood Sorrel White Baneberry, and Wild Mint. Their low Cover Value resulted in their exclusion from the calculation of their Relative Cover Value.

[b] This value is the average of the cover values assigned in each of the twenty 1 m^2 quadrats thrown in each plot.

layer of the riverbottom forests of Beaudry Park sampled. Ten of these species are considered foreign[2] for a riverbottom forest. Beaudry riverbottom forest exhibited thirty-four species, Sair riverbottom forest exhibited thirty species and Jail riverbottom forest exhibited thirty-nine species. Beaudry forest exhibits the most diverse complement of groundcover species characteristic of a riverbottom forest. The Jail riverbottom forest exhibits the lowest such diversity since the natural vegetation was greatly disturbed. The most profound differences in the three forests' groundcover occurs in the species which together are the most dominant species of the groundcover. In Beaudry the dominants are ostrich fern, poison ivy, and sarsaparilla; in the Sair forest the dominants are poison ivy, moonseed, woods nettle and ostrich fern; and in the Jail forest the dominants are ostrich-fern, moonseed and poison ivy. Although ostrich-fern is important in all forests, the importance of poison ivy and wild sarsaparilla vary. In the Jail forest the importance of poison ivy is considerably lower than is the case for the Beaudry and Sair forests. In the Jail and Sair forest, moonseed attains a high importance position in comparison to its secondary importance in the Beaudry forest. In addition, woods nettle is one of the dominant groundcover species in the Sair forest whereas this species is of low importance in the Jail forest and not of significant importance in the Beaudry forest as a result of its infrequent occurrence.

"In general, the greater the number of species adapted for life in a particular forest, the lower will be the relative contribution of any one of them". (Curtis, 1959:158). This concept is particularly evident in the Beaudry forest where the dominant species contribute less and those

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[1] Canada anenome, snowberry, common burdock, goldenrod, spiny-leaved sow thistle, Canada thistle, rose, hedge bindweed, stickseed, red raspberry and chokecherry.

species of lesser importance contribute comparatively more than is the case in the Sair forest where four species contribute approximately equally and together, strongly dominate the groundcover. As a consequence, in the Sair forest, the competition for available space is reduced and the remainder of the species composing the groundcover contribute only slightly. In the Jail forest, the great number of species results in a situation similar to that of the Beaudry forest.

A feature of the groundcover of the riverbottom vegetation type present in Beaudry Provincial Park is the prominant role played by the fern, lily, moonseed, cashew and vine families in this forest strata. In addition, the high content of lianas is worthy of note. The Sair forest exhibits the highest relative cover value for lianas, however this high value is a result of the increased dominance of moonseed in this forest. The Jail riverbottom forest exhibits the lowest total relative cover value for lianas. This seems a further indication of the past disturbance of this riverbottom forest. It is also important to note that nodding trillium is sparingly scattered throughout the three riverbottom forests. This species occurred most frequently in the Jail riverbottom forest (i.e., the only area in which a relative cover value could be calculated).

As with the tree and shrub species of Beaudry Park's riverbottom forest, the herbaceous species are adapted to moist soils, and the distribution of these species can be related to the moisture regime in general. In the first few meander scrolls and troughs from the river edge, an area of wet soils (i.e., due to a high water table and periods of inundation), the herbaceous layer exhibits a characteristic pattern. In the wetter troughs the only vegetation may be Equisetum sp. and green ash seedlings. In the progressively drier troughs green ash, moonseed,

sweet-scented bedstraw and riverbank grape are found. Ostrich-fern may grow as small clumps on the slopes of the meander scroll and forms an extensive cover on the better drained scroll. Further inland from the river,once a higher elevation has been reached but where inundation in the spring results in high soil moistures, ostrich-fern forms a dominant cover on the scrolls and wild grape and green ash grow in the troughs. In the flatter inland areas of the peninsulas (i.e., where the meander scrolls are not pronounced) scattered ostrich-fern clumps occur in the lower depressions and poison ivy and wild sarsaparilla carpet the remainder of the area.

D.2.2 Composition and Structure of the Beaudry Aspen Vegetation Type

D.2.2.1 Tree Strata

The number of trees, number of trees per diameter size class, total basal area, relative frequency, relative dominance and importance value for each species sampled in the Aspen vegetation type are given in Table 17. The location of each sample plot is illustrated in Map 15. The number of trees, trees per hectare, total basal area, relative density, relative dominance and importance values for each species in each sample plot and the average canopy height in each sample plot are provided in Appendix I. As is expected, Table 17 shows that trembling aspen attains the highest importance value (IV = 168) and therefore, is the ecological dominant in this forest. Green ash, Manitoba maple, American elm and bur oak follow in importance values respectively. Trembling aspen, green ash, and Manitoba maple occurring with the same relative frequency are found in association with each other. The high importance value for trembling aspen is a function of its high relative density. The majority of the trembling aspen trees found are in the second diameter size class (15 cm. to 23 cm.). Since trembling aspen grows to a diameter of 20 cm.

Table 17. The Number, Total Basal Area, Relative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Beaudry Aspen Forest.

Species	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Trembling Aspen	6	42	113	17	2	174	4.00	25	67	76	168
Green Ash	6	32	10			42	0.55	25	16	10	51
Manitoba Maple	6	25	6			31	0.36	25	12	7	44
American Elm	3	1	4	2	1	8	0.33	13	3	6	22
Bur Oak	3	3				3	0.03	13	1	1	15
					Total	258	5.27	101	99	100	300

[a] A total of six sample plots were taken.
[b] The tree diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).

to 25 cm. at maturity, it is assumed that this is a mature stand of trembling aspen. The occurrence of green ash and Manitoba maple is not unexpected since the soil also belongs to the Fisher Series and this area is also contained in the floodplain; the soil type and moisture conditions therefore, are similar to that of the riverbottom vegetation type and presents favourable conditions for the growth of these tree species. Although the number of green ash and Manitoba maple present are not great their presence may indicate that succession to an ash-maple-elm riverbottom forest is beginning in this area. This theory is given some support by the presence of a few American elm trees.[1]

D.2.2.2 Shrub Strata

The number of all shrub species sampled in each plot, the total number of shrub stems per sample plot, the total number of shrubs in the six sample plots, stems per hectare, relative density, relative frequency and the importance value (IV) for each shrub species sampled in the Aspen vegetation type is given in Table 18. This table shows that green ash attains the highest importance value and therefore, is the ecologically dominant shrub species in the Aspen forest. Hazelnut and trembling aspen follow in importance respectively. The high importance value for green ash is a function of the high relative density of this species since the three most dominant shrub species occur with approximately relative frequency. The large number of green ash shrubs again points to the possibility that this area of Beaudry Park will succeed to a riverbottom forest eventually. Chokecherry, Manitoba maple, bur oak, downy arrowwood, American elm, highbush cranberry, red osier dogwood and riverbank grape, the remaining complement of shrubs recorded in this forest, exhibit lower importance values.

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[1] American elm growth is restricted to riverbottom habitats in Manitoba under natural conditions.

Table 18. The Number of Shrub Stems of Each Shrub Species Sampled in Each Sample Plot, The Total Number of Shrub Stems, Stems per Hectare, Relative Density, Relative Frequency, and Importance Value of Each Shrub Species Sampled in the Beaudry Aspen Forest.

Shrub Species°	Number of Shrub Stems per Sample Plot Number 1	2	3	4	5	6	Total Number of Shrub Stems	Stems/ Hectare	Relative Density (D)	Relative Frequency (F)	Importance Value (D+F)
Green Ash	30	30	16	10	31	9	126	31135	42	19	61
Hazelnut*		12		2	6	57	77	19027	26	20	46
Trembling Aspen	12	16	21	12	14	1	76	18780	25	19	44
Chokecherry		2	1		3	1	7	1730	2	13	15
Manitoba Maple		1		1	2		4	988	1	10	11
Bur Oak			3			1	4	988	1	6	7
Downy Arrowwood	1		2				3	741	1	6	7
American Elm		1	1				2	494	1	6	7
Total	43	62	44	25	56	69	299	73883	100	99	199

*The number of Hazelnut shrub stems is the sum of the number of Beaked Hazelnut and American Hazelnut stems sampled.
°Additional Shrub species sampled were Highbush Cranberry, Riverbank Grape, and Red Osier Dogwood. Due to the low number of stems counted for each of these species, they were excluded from the calculation of Importance Value per species. In this study Shrub species included woody lianas.

D.2.2.3 Groundcover Strata

Table 19 gives the average cover value for each species sampled in each sample plot,[1] the average of the total cover value for each species in the aspen vegetation type and the relative cover value (importance value) for each species sampled in the aspen vegetation type. This table shows that ostrich fern and poison ivy are the most important species in the groundcover strata. Sarsaparilla, wild black current, green ash, trembling aspen and May lily also contribute significantly (IV is greater than 5). The remaining species sampled in the ground layer of this aspen forest are given in Table 19. The groundcover in this forest is composed of two layers as was the groundcover of the Beaudry riverbottom forest. The upper layer is composed of the larger leafier plants with a large aerial projection such as ostrich-fern, poison ivy, sarsaparilla, wild black current and trembling aspen. The lower layer is made of wild lily-of-the-valley, dewberry, and false Solomon's Seal. The groundcover is composed of a high content of lianas. The major lianas in this forest are poison ivy, sarsaparilla, riverbank grape, and carrion flower; hog peanut and moonseed are also present but these species have a very low importance value.

A total of 35 species were sampled in the groundcover of the Beaudry aspen forest yet only 22 species exhibited cover values great enough to calculate the relative cover values. Those species belonging to the fern, lily, legume, cashew, ginsing, honeysuckle and saxifrage were the most dominant in the ground layer.

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[1] Five only, not six.

Table 19. The Average Cover Value for Each Herbaceous Species Sampled in Each Sample Plot, and the Average Cover Value and Relative Cover Value of the Herbaceous Species Sampled in the Sample Plots Located in the Beaudry Aspen Forest.

Species[a]	Average Cover Value[b] in Sample Plot Number 1	2	3	4	5	Average Cover Value for all Sample Plots	Relative Cover Value
Poison Ivy	1.25	0.90	1.25	1.90	0.80	1.23	15
Ostrich-Fern	2.00	0.60	1.85		1.60	1.21	15
Wild Sarsaparilla	1.20	2.15			1.10	0.89	11
Wild Black Currant	0.20	0.10	0.25	0.20	0.15	0.78	9
Green Ash	0.90	0.80	0.30	0.75	0.35	0.62	7
Trembling Aspen	0.40	0.55	0.65	0.50	0.20	0.46	6
Wild Lily-of-the-Valley	0.20	0.50	0.05	0.70	0.50	0.39	5
Riverbank Grape	0.50	0.20	0.25	0.40	0.25	0.32	4
Dewberry	0.05	0.70	0.25	0.45	0.05	0.29	4
Snowberry		0.05	0.35	0.70	0.05	0.23	3
Meadow-Rue	0.05	0.15	0.25	0.45	0.05	0.21	3
Highbush Cranberry	0.40	0.30			0.20	0.18	2
Canada Anenome	0.05		0.20	0.60		0.17	2
Starry False Solomon's Seal	0.30	0.15	0.15	0.05	0.15	0.16	2
Bur Oak	0.10		0.25	0.20		0.12	1
Manitoba Maple	0.10	0.20	0.05	0.20		0.11	1
Carrion Flower	0.20		0.15		0.20	0.11	1
Downy Arrowwood	0.05	0.20			0.30	0.11	1
American Elm		0.25		0.30		0.11	1
Red osier Dogwood				0.30	0.10	0.08	1
Raspberry		0.35				0.07	1
Sweet-Scented Bedstraw	0.05		0.05	0.25		0.07	1
Hedge Nettle	0.05			0.10	0.15	0.06	1
Rose	0.05		0.20			0.05	1
Nannyberry					0.20	0.04	1
Hog-Peanut				0.20		0.04	1
						Total	100

[a] Additional herbs sampled were Canada Goldenrod, Black Snakeroot, Fringed Loosestrife, Vetchling (Lathyrus venosus), Basswood, Moonseed, Nodding Trillium, Stickseed, and Baneberry. Their low Cover Values resulted in their exclusion from the calculation of their Relative Cover Value.

[b] This value is the average of the cover values assigned in each of the twenty 1 m^2 quadrats thrown in each sample plot.

D.2.3 Composition and Structure of the Oak Vegetation Type

D.2.3.1 Tree Strata

The number of trees, number of trees per diameter size class, total basal area, relative frequency, relative dominance and importance value for each species sampled in the Oak vegetation type are given in Table 20. The location of each sample plot is illustrated in Map 15. The number of trees, trees per hectare, total basal area, relative density, relative dominance and importance values for the species in each sample plot is provided in Appendix I. Appendix I also provides the average height of the canopy in each sample plot. Table 20 shows that bur oak is the ecological dominant in the Oak vegetation type of Beaudry Park. The only other tree species sampled is green ash. This species occurred in only one of the 13 sample plots and its importance value is of relative insignificance. The occurrence of green ash is related to the fact that the sample plot in which it was recorded was close to a small area of riverbottom forest. The majority of the oak trees occurred in the lowest size class. Since bur oak grows to a diameter of 23 to 46 cm. and up to 61 cm. in moist (riverbottom) sites the stand oak forest as a whole is considered approaching maturity.

D.2.3.2 Shrub Strata

The number of all shrub species sampled in each plot, the total number of shrub stems per sample plot, the total number of shrubs in the 13 sample plots, stems per hectare, relative density, relative frequency and the importance value (IV) for each shrub species sampled in the Oak vegetation type is given in Table 21. Table 21 shows that downy arrowwood is the dominant shrub species in the Beaudry Oak forest. Saskatoon, bur oak, hawthorn, green ash, rose and chokecherry, follow in importance, respectively. Beaked hazelnut attains the lowest importance value and

Table 20. The Number, Total Basal Area, RElative Frequency, Relative Density, Relative Dominance, and Importance Value of the Tree Species of the Beaudry Oak Forest.

Species	Number of Plots of Occurrence[a]	Diameter Size Classes (cm)[b] 8-15	15-23	23-30	30-38	Total Number of Trees	Total Basal Area (m^2)	Relative Frequency (F)	Relative Density (D)	Relative Dominance (Do)	Importance Value (F+D+Do)
Bur Oak	13	481	188	24	7	701	11.05	93	99.5	99.5	292
Green Ash	1	1	2			3	.05	7	< 1	1	8
					Total	704	11.10	100	100	100	300

[a] A total of thirteen sample plots were taken.
[b] The tree diameter at breast height (1.3 m) was measured in inches in the field. Diameter Size Classes correspond to diameter at breast height (dbh).

Table 21. The Number of Shrub Stems of Each Shrub Species Sampled in Each Sample Plot, the Total Number of Shrub Stems, Stems per Hectare, Relative Density, Relative Frequency, and Importance Value for Each Shrub Species Sampled in the Beaudry Oak Forest.

Shrub Species	Number of Shrub Stems per Sample Plot Number													Total Number of Shrub Stems	Stems/ Hectare	Relative Density (D)	Relative Frequency (F)	Importance Value (D+F)
	1	2	3	4	5	6	7	8	9	10	11	12	13					
Downy Arrowwood				1				3	4	27	7	7	19	68	16803	40	15	55
Saskatoon	1		1	1	2	4	3	3	3			8	4	30	7413	18	21	39
Bur Oak			7	5	4	5	4	2	1	1				29	7166	17	17	34
Hawthorn	1		2	1				5	3			1	2	15	3707	9	15	24
Green Ash				1	1	1			1			3	2	9	2224	5	13	18
Rose				1		9		1	1					12	2965	7	9	16
Chokecherry				1			2					1		4	988	2	8	16
Beaked Hazelnut										1	1			1	247	1	2	3
Total	2		10	11	7	19	9	14	13	28	8	20	27	168	41513	99	100	199

therefore, its biological contribution to the shrub strata is largely insignificant. Saskatoon is the most widely distributed of the shrub species. Downy arrowwood occurs in those sample plots in which the density of bur oak in the tree strata is less and therefore, creates a more open forest situation. On the other hand, bur oak shrubs usually occurred in those sample plots exhibiting a higher number of trees (bur oak). It is worthy to note that four of the eight shrub species occurring in the oak forest, or fifty percent, belong to the rose family.

D.2.3.3 Groundcover Strata

Table 22 gives the average cover value for each species sampled in each sample plot, the average of the total cover value for each species, and the relative cover value (importance value) for each species sampled in the ground layer of the oak vegetation type. This table shows that snowberry is the most important herb species. Northern bedstraw, downy arrowwood, Saskatoon, grasses and rose follow in importance respectively. The remaining species recorded attain a low importance value and are also presented in Table 22. The groundcover in the Beaudry oak forest unlike that of the Beaudry aspen and Beaudry riverbottom forests consists of only one layer.

Forty-two species were sampled in the groundcover layer of the Beaudry oak forest, however, thirteen of these species exhibited very low average cover values in the few plots in which they did occur and therefore did not attain a statistically significant importance value, ie., IV was less than one. Species belonging to honeysuckle, madder and rose families were dominant in the groundcover; except for a few species the remainder of the herb species belong to the rose, pea, mint and lily families.

Table 22, The Average Cover Value for Each Herbaceous Species Sampled in Each Sample Plot, and the Average Cover Value and Relative Cover Value for the Herbaceous Species Sampled in the Sample Plots Located in the Beaudry Oak Forest.

Species[a]	Average Cover Value[b] in Sample Plot Number 1	2	3	4	5	6	7	8	9	10	11	12	13	Average Cover Value for all Sample Plots	Relative Cover Value
Snowberry	1.80	1.60	1.40	1.20	1.20	1.50	1.20	1.80	1.30	1.30		1.30	0.90	1.30	18
Northern Bedstraw	1.30	1.20	0.80	0.30	1.30	0.80	0.80	1.10	0.70	0.40	0.40	0.70	0.50	0.79	11
Downy Arrow-wood	0.10		0.10					0.40	0.40	1.50	0.20	1.00	2.00	0.51	7
Saskatoon	0.60	0.30	0.40	0.20	0.40	0.80	0.40	0.50		0.60	0.70	0.70	0.50	0.46	6
Grasses	1.30	0.40	0.80	0.80	0.50		0.60	0.10	0.80		0.50	0.10		0.45	6
Rose	0.20	0.50	0.60	0.40	0.10	0.70	0.80	0.40	0.10	0.30	0.70	0.70	0.20	0.43	6
Wild Strawberry	0.10		0.10	0.10	0.40	0.60	0.20	0.10	0.20	0.60	0.10	0.20	0.80	0.27	4
Lindley's Aster	0.10	0.10	0.40	0.40	0.30	0.50	0.50	0.20	0.10	0.10	0.50	0.20		0.26	4
Meadow-Rue	0.10	0.30	0.20	0.10	0.10	0.50	0.30	0.20	0.30	0.20	0.40	0.20	0.20	0.24	3
Green Ash			0.20	0.50	0.50	0.10			0.20	0.40	0.10	0.20	0.70	0.21	3
Goldenrod (sp)		0.10	0.60	0.40		0.10	0.60			0.10	0.10	0.20	0.10	0.17	2
Spiny-Leaved Sow Thistle	1.00	0.60	0.10		0.10			0.10	0.20		0.10			0.17	2
Bur Oak	0.10	0.10	0.60	0.10	0.10	0.20	0.30	0.10		0.10	0.10	0.30	0.10	0.17	2
Chokecherry	0.10	0.40	0.10				0.30	0,40		0.10	0.50	0.20		0.16	2
Black Snakeroot	0.10		0.10	0.10	0.40	0.20	0.20	0.10		0.40		0.20	0.20	0.15	2
Golden Alexander	0.10		0.10	0.20	0.10	0.30	0.30			0.10	0.20	0.10	0.40	0.15	2
Wild Lily-of-the Valley	0.10					0.20		0.10	0.20	0.30	0.20	0.50	0.20	0.14	2
American Vetch	0.30	0.10	0.10	0.10	0.10	0.10		0.20		0.20	0.10	0.20	0.20	0.13	2
Fringed Loosestrife			0.30	0.10	0.40	0.10	0.10		0.40	0.10	0.10			0.12	2
Hawthorn	0.10		0.10		0.20	0.20	0.10	0.20	0.10	0.30		0.20	0.10	0.12	2
Vetchling*	0.10	0.10			0.20	0.10	0.10	0.10	0.30	0.10	0.20	0.10		0.10	1
Commandra			0.20	0.10	0.10	0.10			0.20	0.10	0.30			0.08	1
Cream Coloured Vetchling		0.10		0.20	0.30	0.10				0.10			0.20	0.08	1
Common Yarrow	0.10	0.10	0.20	0.10	0.10	0.10	0.10		0.10		0.10			0.08	1
Poison Ivy		0.10		0.40		0.10		0.20			0.10	0.10		0.08	1
Carrion Flower	0.10	0.10	0.10					0.10	0.10	0.10	0.10		0.20	0.07	1
Common Dandelion	0.10	0.10			0.10	0.10	0.20	0.10				0.10		0.06	1
Grove Sandwort		0.10		0.10	0.10	0.10	0.10	0.10						0.05	1
Violet		0.20								0.10		0.20		0.04	1
														Total	97

[a]Additional herbs sampled were Canada Anenome, Harebell, Solomon's Seal, Manitoba Maple, Beaked Hazelnut, Alumroot, Twining Honeysuckle, Great Solomon's Seal, Hog-Peanut, Wild Columbine, American Hazelnut, Cow Parsnip, and Wood Sorrel. Their low Cover Value resulted in their exclusion from the calculation of their Relative Cover Value.

[b]This value is the average of the cover values assigned in each of the twenty 1 m^2 quadrats thrown in each plot.

*This vetchling is also commonly known as Wild Peavine (Lathyrus venosus).

D.3 Wildlife

D.3.1 Birds

D.3.1.1 Introduction

Ninety-five species of birds were observed within Beaudry Provincial Park in the summer of 1977 (see Appendix G). Summer resident and migrant bird species constitute the majority of species which may occur within Beaudry Provincial Park. The largest number of these species are commonly known as songbirds.

D.3.1.2 Breeding-Bird Censuses

The procedure followed in conducting the breeding-bird censuses, the location of the census plots in the Beaudry and Sair riverbottom forests and a summary of each census are included in Appendix H and I.

Beaudry Riverbottom Forest Breeding-Bird Census[1]

Twenty-one breeding birds were found in the Beaudry riverbottom forest. One of these species was a raptor (Broad-Winged Hawk), the remaining twenty species were songbirds. The most abundant passerine species censused were the Least Flycatcher, the Northern Oriole, American Robin, Rose-breasted Grosbeak, Great-Crested Flycatcher, Eastern Wood Peewee, Red-Eyes Vireo and the Warbling Vireo. Twelve songbird species were commonly found in the census plot; the remaining bird species were found to occur just outside the plot or in very low numbers.

A few generalizations regarding the relationship between the occurrence of a bird species and the existing vegetation can be made. Northern Orioles appeared to be associated with the large trees occuring 100 m. to 200 m. from the river's edge and were not common in the centre of the peninsula. The Yellow Warbler as well as the Warbling Vireo were associated with smaller trees and shrub thickets bordering the river's edge.

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[1] The data for this Breeding-bird Census was collected by W. Koonz, Non-Game Biologist, Wildlife Research, Department of Renewable Resources and Transportation Services.

An observation worthy of note is that very few of the breeding bird species cnesused were found to occur in the deeper regions of the peninsula. The majority were found in the first two-thirds of the peninsula and in the lands bordering the river (within 100 m. to 250 m. of the river's banks). Those species that did occur in the remote regions of the songbird census plot were the Red-Eyed Vireo, Great-Crested Flycatcher, Red-breasted Grosbeak, Yellow Warbler, Baltimore Oriole and Eastern Wood Peewee.

Sair Riverbottom Forest Breeding-Bird Census[1]

Eleven breeding-bird species were found in the Sair riverbottom forest. The most abundant songbirds were the Least Flycatcher, Red-Eyed Vireo, American Robin, Rose-breasted Grosbeak and Warbling Vireo.

Disturbances of the bird populations inhabiting this peninsula were caused by the Dutch Elm Disease Erradication Program. The occurrence of this activity during the course of the Breeding-Bird Census period precludes any generalizations regarding bird species'/vegetation association other than the observation that the Yellow Warbler was found in dense thickets of shrubs and small trees (Willow (sp), beaked hazelnut and green ash) close to the river's edge. The total number of species and the total number of territorial male or female birds is low in comparison to that found for the Beaudry riverbottom forest census particularly in the light of the fact that the Beaudry Breeding-Bird Census Plot is only two-thirds the size of the Sair plot. Although this difference in species diversity and population numbers could be attributed to the Dutch Elm Disease Erradication Program's activities of pruning and burning in the area in the last two years,[2] these differences can more likely be attributed

[1] The data for this Breeding-Bird Census was collected by W. Koonz and N. Foy.

[2] These activities usually take place in the winter, however, due to a dry summer, fall and winter in 1976, burning was postponed to spring, 1977.

to differences in vegetation and are an indication of the influence of past land uses. As discussed in previous sections, although the Sair riverbottom forest is a healthy stand, it is in an unnatural condition due to past land uses and practices. The Beaudry riverbottom forest experienced few intrusions by man however, and is in a natural state. The Beaudry riverbottom forest canopy is dominated by green ash, and American elm does not play a very significant ecological role. Whereas in the Sair riverbottom forest, American elm and green ash reached equal importance. In addition, the Beaudry riverbottom forest exhibits a greater diversity and density (per hectare) of shrub species. The influence of past land uses are also evident in the herbaceous layer. Unlike the Beaudry riverbottom forest which is dominated by ostrich-fern, poison ivy and wild sarsaparilla the species of greatest ecological dominance in the Sair riverbottom forest herb layer are poison ivy, moonseed, woods nettle and ostrich-fern.

D.3.2 Mammals: Small Mammal Trapping

The objective of small mammal trapping in Beaudry Provincial Park was to inventory the small mammal populations inhabiting a number of vegetation types present in the park. The methodology for small mammal trapping and the location of the specific areas of Beaudry Park chosen for small mammal trapping investigations are given in Appendix H. Appendix I.6 summarizes the results of the small mammal trapping inventory.

The term "small mammal" is generally defined as "free-living small rodents and insectivores" (Delany, 1974:1). Five small mammal species and one member of the squirrel family were sampled through small mammal trapping. Table 23 shows the frequency of capture (catch per 100 trap

Table 23. The Frequency of Capture (Catch per 100 Trap-Nights) of Small Mammal Species from Small Mammal Trapping Plots Established in the Woodland and Grassland Small Mammal Study Areas of Beaudry Natural Provincial Park.

Species	Beaudry Riverbottom Forest	Sair Riverbottom Forest	Jail Riverbottom Forest	Beaudry Aspen Forest	Beaudry Oak Forest	Retention Pond Prairie	Inactive Inactive Streambed	Upland Shrub Meadow
Shrew *Sorex sp*			0.5		0.3	1.6		20.0
Northern Flying Squirrel *Glaucomys sabrinus*					0.3			
Deer Mouse *Peromyscus maniculatus*	14.4	20.3	14.4	7.8		3.1		
Gapper's Red-Backed Vole *Cletrionomys gapperi*	7.4	15.2	22.8	10.3			12.5	
Meadow Vole *Microtus pennsylvanicus*						6.3	12.5	10.0
Meadow Jumping Mouse *Zapus hudsonicus*					0.3			

nights) of shrews, mice, voles and the squirrel species (Northern Flying Squirrel) in each sample area. Although this Table does give some indication of the abundance of small mammal species, caution in the direct application of these results is advised, since behaviour patterns regarding traps may differ between individuals and species, (Delany,1974 and Ryszkowski,1969), and since the small mammal trapping regime adopted here was not sophisticated enough to make statements regarding a particular species' density.[1] It should also be stressed that this discussion is not intended as a comparison between vegetation types but rather a summary of the data for each vegetation type presented in Table 23.[2]

The deer mouse was the most abundant small mammal in the park. Next in abundance to deer mice were Gapper's Red-backed voles (also known as the Northern Redback Vole) 130 of which were captured in 1,350 trap-nights. In descending order of abundance after deer mice and the redback voles are the meadow vole, shrews, and meadow jumping mouse. The meadow jumping mouse was the scarcest small mammal species taken.

It is evident from Table 23 that the moist riverbottom and aspen forests supported the greatest number of small mammals. It is unusual however, that only one shrew was taken in these areas. Deer mice were found to be more abundant than redback voles in the Beaudry and Sair riverbottom forests whereas the reverse occurred in the Jail riverbottom

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[1] The density of small mammal populations are determined through intensive trapping regimes and statistical analysis (see Delany, 1974 and Smith et al., 1969).

[2] Comparison of data between all vegetation types is not possible since different sampling intensities and methods designs were used for each. Comparisons are therefore, restricted to vegetation types which were sampled by the same method for three consecutive nights.

and Beaudry aspen forests. In contrast to the relatively large number of small mammals sampled in the preceding forests, only three small mammal species were taken in the Beaudry Oak forest although the sample method and number of trapping nights (3) were identical. This discussion leads to the conclusion that the riverbottom forest, particularly the Sair and Jail riverbottom forests, can support the greatest number of small mammals. One can therefore, postulate that these riverbottom areas could more ably support carniverous wildlife species such as the red fox, raccoon, skunk and raptors.[1]

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[1] Observations in the summer of 1977 seem to support this assumption. For example, raccoons and skunks were most frequently observed in the riverbottom forest. Also a Great Grey Owl was observed in the Sair riverbottom forest and a Great Horned Owl inhabited the Jail riverbottom forest.

Appendix E

LAND USE ZONES FOR MANITOBA'S PARK LANDS

Class I: Special Areas

a. Purpose - To preserve unique features or situations only,

b. Characteristics - The area is of unique provincial significance for history, geology, ecology, or the like, or for scientific purposes.

c. Activities and Development - Activities shall be oriented only to understanding and appreciating the unique feature(s). Development will be solely those necessary for the utilization and interpretation of the unique features of the area. Preservation of the unique features will dictate the scale and intensity of development.

Class II: Primitive Environment Areas

a. Purpose - To preserve a primitive or isolated environment.

b. Characteristics - The area is undisturbed by commercial utilization, resource exploitation or mechanized transportation, and provides for compatible recreational use.

c. Activities and Development - Such appropriate uses as hiking and other foot travel, horseback riding, nature study, fishing, hunting, canoeing and other non-power boating will be encouraged with the development of trails, water and portage routes,primitive camping sites and shelters and the provision of interpretative and information material.

Class III: Natural Recreation Areas

a. Purpose - To create an area of low density nature-oriented recreation and be used also as a buffer protecting Class I and Class II areas.

b. Characteristics - This is a rural environment which is largely, though not totally free of unrelated intrusions of facilities and management practises.

c. Activities and Development - Emphasis is on natural activities. Recreational activities include low density car-access, camping, interpretative walks, picnicking, pleasure driving, boating, swimming, fishing and hunting. Facilities would include car-access campgrounds, nature centres and trails, parking lots, boat launching, and group-camping sites. Also, it may provide supply stations for travellers into Class I and Class II areas.

Class IV: General Outdoor Recreation Areas

a. Purpose - To provide a wide range of outdoor recreational opportunities in a natural setting.

b. Characteristics - By virtue of it natural features and through development of facilities the area is capable of sustaining a high level of recreational opportunities and activities.

c. Activities and Development - In addition to the facilities acceptable for Class III, activities at a higher density and in less relative isolation are acceptable. In the development of these facilities, it is desirable to retain a relatively natural setting. Other facilities include golf courses, tennis courts and ski hills.

Class V: Intensive Use Areas

a. Purpose - To provide a concentration of service facilities and recreational activities, including complementary recreational developments suitable for the provision of a balanced recreational experience.

b. Characteristics - Location relative to visitors' entry points or concentrations dictate the choice of site more than the physical or environmental aspects of the area. It is desirable, however, to provide areas suitable from all three aspects.

c. Activities and Development - Those services and facilities necessary to support recreational activities and developments are contained in these areas. These may include motels, restaurants, service stations, stores, and staff housing groups.

Subclasses:

Each Class or Land Use Zone may be subdivided into four subclasses which establish limits upon the density of visitation. The Subclasses reflect the tolerance of the natural vegetation and wildlife populations to recreational use.

Subclass a. Severe

b. Moderate

c. Slight

d. Negligible

Appendix F

FLORAL AND FAUNAL FEATURES OF SIGNIFICANCE FOR INTERPRETATION IN BEAUDRY PROVINCIAL PARK

F.1 Introduction

The Interpretation Division of Manitoba Parks Branch utilizes the concept of park themes to provide some direction to the information to be communicated to the user. The existing park features which most represent the region and the individual park and/or are of provincial or national significance, are selected and organized into themes such as natural history or cultural history. The ultimate purpose of themes is to suggest emphasis and prevent unnecessary duplication on a province-wide basis (Anderson, 1977). Four natural history themes have been delineated:

1. Land forms and processes
2. Terrestrial ecosystems
3. Freshwater ecosystems
4. Human impact

(Anderson, 1977). Those floral and faunal features of Beaudry Provincial Park considered as a significant focus in the interpretation of this park's natural environment are identified in the following section.[1] These features will be identified in point form under the themes of Terrestrial Ecosystems and Freshwater Ecosystems.

F.2 Terrestrial Ecosystems

F.2.1 Riverbottom Community

Floral Features

-- The ecological significance of this deciduous forest, for example,

[1] The floral and faunal features were identified through the floral and faunal inventory.

two areas were identified for preservation by the International Biological Programme

-- The diversity of deciduous tree species

-- The size of the mature trees, examples are cottonwood and American elm

-- The ecological dominance of green ash in this community

-- The ecological dominance of American elm and green ash in the riverbottom forest (Sair riverbottom forest) disturbed by human use

-- The characteristic location of specific tree species, for example, the niche for cottonwood as a result of natural processes such as river flooding and erosion and deposition

-- The seral stages of a riverbottom community

-- The hydric willow shoreline as the first seral stage and its existence in relation to position on the water course and alluvial deposition of soil

-- The lush ground layer: ostrich-fern, wild sarsaparilla and its distribution in relation to the meander scrolls

-- The importance of poison ivy in the ground layer

-- The growth of hog-peanut and wood nettle in modified areas

-- The presence and diversity of lianas; riverbottom grape, bittersweet, poison ivy

-- The rare and/or fragile plants in the community: riverbank grape, ostrich-fern, bittersweet, green ash, nodding trillium, spotted corralroot, lopseed

Faunal Features

-- The presence of Great Gray Owl

-- The other raptors such as the Great Horned Owl, Saw-Whet Owl, Broad-winged Hawk supported here and therefore, the plentiful availability of feed in Beaudry Park as a whole

-- The habitat and behavior of the raccoon and skunk; raccoons prefer to den in a hole in the trunk of large American elms
-- The number of songbirds found here and their insectivore food habits
-- The utilization of this habitat for nesting by the Black-Billed Cuckoo
-- The utilization of this habitat by White-tailed deer for calving.

F.2.2 Aspen Riverbottom Community

Floral Features

-- The dominance of trembling aspen
-- The function of trembling aspen as a "nurse" tree in a recovery of the area after intensive logging
-- The lush ground layer which exhibits plant species characteristic of undisturbed riverbottom forests
-- The rare and/or fragile plants in the community: riverbank grape, ostrich-fern, bittersweet, green ash, nodding trillium, indian-pipe, rattlesnake-fern.

F.2.3 Oak/Meadow Community

Floral Features

-- The dominance of tree cover by bur oak
-- The ground layer species as characteristic of a drier soil moisture in comparison to the riverbottom community
-- The maintenance of the meadow due to spring run-off when it acts as a drainage channel.

Faunal Features

-- Habitat for white-tailed deer
-- Habitat for northern flying squirrel
-- Habitat for passerine birds
-- Spring and early summer infestation by wood ticks

F.2.4 Tall Grass Prairie Community

Floral Features

-- A fragment of a once extensive landscape

-- The need to protect all the plant species as they are vanishing. Specific species which require protection are Big Bluestem, Small Yellow Lady Slipper, Closed Gentian

-- Prairie plant ecology, i.e., growth in relation to soil moisture, rate of evapo-transpiration, etc.

F.3 Freshwater Ecosystems

F.3.1 Retention Pond Community

Floral Features

-- Aquatic plant species characteristic of this community: sedges, cat-tails, and cordgrass and their abundance as a function of the water level

-- Succession of the littoral community

Faunal Features

-- The potential use of this area for waterfowl production and staging

-- The use of this area by shorebirds such as the Great Blue Heron and aquatic fish-eating birds such as the Double-Crested Cormorant

-- The use of this area by aquatic mammals such as the American beaver and muskrat

-- The use of this area by the raccoon and white-tailed deer.

Appendix G

PLANT, BIRD, AND MAMMAL SPECIES LISTS

G.1 Plant families identified within Beaudry Provincial Park as of October 1977.

	Family Name	Common Name	Total No. of Species
Division Pteridophyta			
	Equisetaceae	Horsetail	3
	Ophioglossaceae	Adder's-tongue	1
	Polypodiaceae	Fern	1
Division Spermatophyta			
Subdivision	Gymnospermae		
	Pinaceae	Pine	1
Subdivision	Angiospermae		
Class	Monocotyledoneae		
	Typhaceae	Cat-tail	1
	Alismataceae	Water-plantain	2
	Gramineae	Grass	15
	Cyperaceae	Sedge	3
	Juncaceae	Rush	1
	Lilaceae	Lily	8
	Iridaceae	Iris	1
	Orchidaceae	Orchis	2
Class	Dicotyledoneae		
	Salicaceae	Willow	8
	Betulaceae	Birch	3
	Fagaceae	Beech	1
	Ulmaceae	Elm	1
	Cannabinaceae	Hemp	1
	Urticaceae	Nettle	2
	Santalaceae	Sandalwood	1
	Polygonaceae	Buckwheat	5
	Chenopodiaceae	Goosefoot	1
	Caryophyllaceae	Pink	3
	Ranunculaceae	Crowfoot	9
	Menispermaceae	Moonseed	1
	Cruciferae	Mustard	4
	Saxifragaceae	Saxifrage	3
	Rosaceae	Rose	16
	Leguminosae	Pulse	16
	Oxalidaceae	Wood-sorrel	1
	Geraniaceae	Geranium	1
	Anacardiaceae	Cashew	1
	Celastraceae	Staff-tree	1
	Aceraceae	Maple	1
	Vitaceae	Vine	2
	Tiliaceae	Linden	1
	Violaceae	Violet	1
	Elaeagnaceae	Oleaster	1
	Onagraceae	Evening-primrose	1

Family Name	Common Name	Total No. of Species
Araliaceae	Ginseng	1
Umbelliferae	Parsley	5
Cornaceae	Dogwood	1
Pyrolaceae	Wintergreen	1
Primulaceae	Primrose	1
Oleaceae	Olive	2
Gentianaceae	Gentian	1
Apocynaceae	Dogbane	2
Asclepiadaceae	Milkweed	1
Convolvulaceae	Convolvulus	1
Boraginaceae	Borage	2
Labiatae	Mint	9
Solanaceae	Nightshade	1
Phrymaceae	Lopseed	1
Plantaginaceae	Plantain	1
Rubiaceae	Madder	2
Caprifoliaceae	Honeysuckle	6
Campanulaceae	Bluebell	1
Compositae	Composite	38
	Total	202

G.2 Plant species identified within Beaudry Provincial Park as of Oct. 1977

Common Name(s)	Scientific Name
Family Equisetaceae (Horsetail)	
Wood Horsetail	Equisetum sylvaticum L.
Common Scouring Rush	Equisetum hyemale L. var. affine
Field Horsetail[1]	Equisetum arvense L.
Family Ophioglossaceae (Adder's-tongue)	
Rattlesnake - Fern	Botrychium virginianum (L) Sw.
Family Polypodiaceae (Fern)	
Ostrich-Fern	Matteuccia struthiopterus (L). Todaro var. pensylvanica (Willd.) Morton
Family Pinaceae (Pine)	
White Spruce	Picea glauca (Moench) Voss
Family Typhaceae (Cat-tail)	
Common Cat-tail	Typha latifolia L.
Family Alismataceae (Water-plantain)	
Water Plantain	Alisma triviale Pursh.
Arrowhead	Sagittaria latifolia Willd.
Family Gramineae (Grass)	
Brome Grass	Bromus inermis Leyss.
Fescue-Grass	Festuca rubra L.
Wiregrass[2]	Poa compressa L.
Fowl-meadow Grass[2]	Poa palustris L.
Kentucky Bluegrass	Poa pratensis L.
Reed[2]	Phragmites australis (Cav.) Trin. ex Steudel
Wheat-Grass[2]	Agropyron trachycaulum (Link) Malte
Crested Wheat-Grass[2]	Agropyron cristatum (L.) Gaertn.
Squirrel-tail Grass[2]	Hordeum jubatum L.
June Grass	Koeleria cristata (L.) Pers.
Porcupine-Grass[2]	Stipa spartea Trin.
Timothy	Phleum pratense L.
Cord-Grass	Spartina pectinata Link
Big Bluestem	Andropogon gerardi Vitman
Panic-Grass[2]	Panicum leibergii (Vasey) Scribn.

Common Name(s)	Scientific Name
Family Cyperaceae (Sedge)	
Sedge[2]	Carex brevior (Dew.) Mack.
Sedge[2]	Carex laeviconica Dew.
Sedge[2]	Carex lanuginosa Michx.
Family Juncaceae (Rush)	
Rush[2]	Juncus balticus Willd. var. littoralis Engelm.
Family Lilaceae (Lily)	
Wild Onion	Allium stellatum Fraser
Carrion-flower	Smilax herbacea L. var. lasioneura
Solomon's Seal	Polygonatum canaliculatum (Muhl.) Pursh.
Nodding Trillium	Trillium cernuum L.
Wild Lily-of-the-Valley	Maianthemum canadense var. interius Fern.
Starry False Solomon's Seal	Smilacina stellata (L.) Desf.
Three-leaved False Solomon's Seal	Smilacina trifolia (L.) Desf.
False Spikenard	Smilacina racemosa (L.) Desf.
Family Iridaceae (Iris)	
Blue-eyed Grass	Sisyrinchium montanum Greene
Family Orchidaceae (Orchis)	
Small Yellow Lady's-Slipper	Cypripedium calceolus L. var. parviflorum (Salisb.) Fern.
Spotted Coralroot	Corallorrhiza maculata Raf.
Family Salicaceae (Willow)	
Trembling Aspen	Populus tremuloides Michx.
Balsam Poplar	Populus balsamifera L.
Poplar Hybrid[1]	Populus balsamifera L.X.P. deltoides Marsh.
Cottonwood	Populus deltoides Marsh.
Sandbar-Willow	Salix interior Rowlee
Yellow Willow[2]	Salix lutea Nutt.
Willow[2]	Salix petiolaris Sm.
Willow[2]	Salix bebbiana Sarg.
Family Betulaceae (Birch)	
American Hazelnut	Corylus americana Watt.
Beaked Hazelnut	Corylus cornuta Marsh.
Paper Birch	Betula papyrifera Marsh.

Common Name(s)	Scientific Name
Family Fagaceae (Beech)	
Bur Oak	Quercus macrocarpa Michx.
Family Ulmaceae (Elm)	
American Elm	Ulmus americana L.
Family Cannabinaceae (Hemp)	
Common Hop	Humulus lupulus L.
Family Urticaceae (Nettle)	
Slender Nettle	Urtica dioica L. var. procera Wedd.
Wood Nettle	Laportea canadensis (L.) Wedd.
Family Santalaceae (Sandlewood)	
Commandra	Commandra richardsiana Fern.
Family Polygonaceae (Buckwheat)	
Golden Dock	Rumex maritimus L. var. fueginus (Philippi) Dusén
Yellow Dock	Rumex crispus L.
Swamp Smartweed	Polygonum coccineum Muhl.
Black Bindweed	Polygonum convolvulus L.
Swamp Smartweed	Polygonum coccineum var. pratincola (Greene) Stanford.
Family Chenopodiaceae (Goosefoot)	
Lamb's-quarters. Pigweed	Chenopodium album L.
Family Caryophyllaceae (Pink)	
Grove - Sandwort	Arenaria lateriflora L.
Bladder - Campion	Silene cucubalus Wibel
Catchfly. Campion[2]	Silene cserei Baumg
Family Ranunculaceae (Crowfoot)	
Wild Columbine	Aquilegia canadensis L.
White Baneberry	Actaea rubra forma neglecta (Gillman) Robins.
Red Baneberry	Actaea rubra (Ait.) Willd.
Thimbleweed	Anenome cylindrica Gray
Canada Anenome	Anenome canadensis L.
Meadow-Rue	Thalictrum venulosum Trel.
Cursed Crowfoot	Ranunculus sceleratus L.
Seaside Crowfoot	Ranunculus cymbalaria Pursh
Kidneyleaf Buttercup	Ranunculus abortivus L.

Common Name(s)	Scientific Name
Family Menispermaceae (Moonseed)	
Moonseed, Yellow Parilla	Menispermum canadense L.
Family Cruciferae (Mustard)	
Stinkweed	Thlaspi arvense L.
Peppergrass[2]	Lepidium densiflorum Schrad.
Charlock[2]	Brassica kaber (DC.) L.C. Wheeler
Tansy-Mustard[2]	Descurainia pinnata (Walt.) Britt. var. brachycarpa (Richards.) Fern.
Family Saxifragaceae (Saxifrage)	
Alumroot	Heuchera richardsonii R. Br.
Wild Black Current	Ribes americanum Mill
Gooseberry	Ribes oxycanthoides L.
Family Rosaceae (Rose)	
Rose	Rosa blanda Ait
Rose	Rosa woodsii Lindl.
Rose	Rosa acicularis Lindl.
Common Strawberry	Fragaria virginiania Duschesne
Meadow-Sweet	Spiraea alba Du Roi
Yellow Avens	Geum aleppicum Jacq. var. strictum (Ait.) Fern.
Three-flowered Avens	Geum triflorum Pursh
Silverweed	Potentilla anserina L.
Tall Cinquefoil	Potentilla arguta Pursh
Brook Cinquefoil	Potentilla millegrana Engelm.
Cinquefoil	Potentilla norvegica L.
Raspberry	Rubus idaeus L. var. strigosus (Michx.) Maxim
Choke-Cherry	Prunus virginiana L.
Wild Plum	Prunus americana Marsh.
Juneberry	Amelanchier alnifolia Nutt.
Hawthorn[2]	Crataegus succulenta Link
Family Leguminosae (Pulse or Pea)	
White Clover	Trifolium repens L.
Red Clover	Trifolium pratense L.
Yellow Melilot	Melilotus officinalis (L.) Lam
White Melilot	Melilotus alba Desr.
Alfalfa	Medicago sativa L.
Black Medick	Medicago lupulina L.
Fragrant False Indigo	Amorpha nana Nutt.
Prairie-Clover	Petalostemum purpureum (Vent.) Rydb.
Milk-Vetch[2]	Astragalus canadensis L.
Milk-Vetch[2]	Astragalus flexuosus Dougl.

Common Name(s)	Scientific Name
Family Leguminosae (Pulse or Pea)	
Milk-Vetch[2]	Astragalus goniatus Nutt.
Wild Licorice	Glycyrrhiza lepidota (Nutt.) Pursh
Pale Vetchling	Lathyrus ochroleucus Hook.
Vetchling[2]	Lathyrus palustris L.
Vetchling	Lathyrus venosus Muhl. var. intonsus Butt + St. John
Hog-Peanut	Amphicarpa bracteata (L.) Fern.
Family Oxalidaceae (Wood-Sorrel)	
Yellow Wood-Sorrel	Oxalis stricta var. piletocarpa Wieg
Family Geraniaceae (Geranium)	
Cranesbill	Geranium bicknellii Britt.
Family Anacardiaceae (Cashew)	
Poison Ivy	Rhus radicans L. var. rydbergii (Small) Rehd.
Family Celastraceae (Staff-tree)	
Climbing Bittersweet	Celastrus scandens L.
Family Aceraceae (Maple)	
Manitoba Maple	Acer negundo L.
Family Vitaceae (Vine)	
River-bank Grape	Vitus riparia Michx.
Virginia Creeper	Parthenocissus inserta (Kerner) K. Fritsch
Family Tiliaceae (Linden)	
Basswood	Tilia americana L.
Family Violaceae (Violet)	
Violet	Viola pensylvanica Michx. var. leiocarpa (Fern. + Wieg) Fern.
Family Elaeagnaceae (Oleaster)	
Wolf Willow. Silverberry	Elaeagnus commutata Bernh.
Family Onagraceae (Evening Primrose)	
Fireweed	Epilobium angustifolium L.

Common Name(s)	Scientific Name
Family Araliaceae (Ginseng)	
Wild Sarsaparilla	Aralia nudicaulis L.
Family Umbelliferae (Parsley)	
Sanicle. Black Snakeroot	Sanicula marilandica L.
Zizia	Zizia aptera (Gray) Fern.
Golden Alexanders	Zizia aurea (L.) W.D.J. Koch
Water Parsnip	Sium suave Walt.
Cow-Parsnip	Heracleum lanatum Michx.
Family Cornaceae (Dogwood)	
Red Osier	Cornus stolonifera Michx.
Family Pyroloceae (Wintergreen)	
Indian-pipe	Monotropa uniflora L.
Family Primulaceae (Primrose)	
Fringed Loosestrife	Steironema ciliatum (L.) Raf.
Family Oleaceae (Olive)	
Black Ash	Fraxinus nigra Marsh.
Green Ash	Fraxinus pennsylvanica var. subintegerrima (Vahl) Fern.
Family Gentianaceae (Gentian)	
Closed Gentian	Gentiana andrewsii Griseb.
Family Apocynaceae (Dogbane)	
Spreading Dogbane	Apocynum androsaemifolium L.
Dogbane	Apocynum sibiricum Jacq.
Family Ascelepiadaceae (Milkweed)	
Milkweed	Asclepias oxialifolia Dcne.
Family Convolvulaceae (Convolvulus)	
Hedge-Bindweed. Wild Morning-glory	Convolvulus sepium L.
Family Boraginaceae (Borage)	
Puccoon	Lithospermum canescens (Michx.) Lehm.
Stickseed	Hackelia americana (Gray) Fern.

Common Name(s)	Scientific Name
Family Labiatae (Mint)	
Maddog Skullcap	Scutellaria lateriflora L.
Common Skullcap	Scutellaria galericulata L. var. epilobiitolia (Hamilt.) Jordal
Giant Blue Hyssop	Agastache foeniculum (Pursh) Ktze.
False Dragonhead	Dracocephalum formosius (Lunell) Rydb.
Common Motherwort	Leonurus cardiaca L.
Woundwort[2]	Stachys palustris L. var. pilosa (Nutt.) Fern.
Smooth Hedge-nettle	Stachys tenuifolia Willd. var. hispida (Pursh) Fern.
Wild Bergamont	Monarda fistulosa L.
Mint	Mentha arvensis L. var. villosa (Benth.) Stewart
Family Solanaceae (Nightshade)	
Nightshade	Solanum dulcamara
Family Phrymaceae (Lopseed)	
Lopseed	Phryma leptostachya L.
Family Plantaginaceae (Plantain)	
Plantain	Plantago major L.
Family Rubiaceae (Madder)	
Northern Bedstraw	Galium septentrionale R. + S.
Sweet-scented Bedstraw	Galium triflorum Michx.
Family Caprifoliaceae (Honeysuckle)	
Snowberry	Symphiocarpus albus (L.) Blake
Wolfberry. Western Snowberry	Symphiocarpus occidentalis Hook
Honeysuckle	Lonicera dioica L. var. glaucescens (Rydb.) Butters
Downy Arrow-wood	Viburnum rafinesquianum Schultes
Highbush-Cranberry	Viburnum trilobum Marsh.
Nannyberry	Viburnum lentago L.
Family Campanulaceae (Bluebell)	
Harebell	Campanula rotundifolia L.

Common Name(s)	Scientific Name
Family Compositae (Composite)	
Blazing-Star	Liatris liqulistylis (Nels) K. Schum
Curlycup-Gumweed	Grindelia squarrosa (Pursh) Dunal
Goldenrod	Solidago rigida L.
Goldenrod	Solidago canadensis L.
Goldenrod	Solidago mollis Bartl.
Goldenrod[2]	Solidago missouriensis Nutt.
Aster	Aster ciliolatus Lindl.
Aster	Aster pansus (Blake) Cronq.
Aster	Aster laevis L.
Fleabane	Erigeron philadelphicus L.
Great Ragweed[2]	Ambrosia trifida L.
Ox-eye[2]	Heliopsis helianthoides (L.) Sweet var. scabra (Dunal) Fern.
Black-eyed Susan	Rudbeckia serotina Nutt.
Coneflower	Rudbeckia laciniata L.
Sunflower	Helianthus maximiliani Schrad
Sunflower	Helianthus laefiflorus Pers. var. rigidus (Cass) Fern.
Jerusalem Artichoke	Helianthus tuberosus L. var. subcanescens Gray
Stick-tight	Bidens cernua L.
Beggar-ticks	Bidens frondosa L.
Common Yarrow, Milfoil	Achillea millefolium L.
Yarrow	Achillea sibirica Ledeb.
Yarrow[2]	Achillea lanulosa Nutt.
Wormwood[2]	Artemisia absinthium L.
Wormwood[2]	Artemisia ludouiciana Nutt.
Southernwood	Artemisia abrotanum L.
Ragwort	Senecio aureus L.
Common Burdock	Arctium minus (Hill) Bernh.
Thistle	Cirsium flodmanii (Rydb.) Arthur
Canada Thistle	Cirsium arvense (L.) Scop.
Thistle[2]	Cirsium arvense f. albiflorum (Rand + Redf.) Hoffm.
Goat's Beard	Tragopogon dubius Scop.
Common Dandelion	Taraxacum officinale Weber
Sow-thistle[2]	Sonchus uliginosus Bieb
Lettuce	Lactuca pulchella (Pursh
False Dandelion	Agaseris glauca (Nutt.) Greene
Rattlesnake-root[2]	Prenanthes racemosa L.
White Lettuce	Prenanthes alba L.
Hawk-weed	Hieracium umbellatum L.

[1]Johnson, K. 1972

[2]Levin, M. H. and G. M. Keleher, 1969. Can. Field-Nat. 83:113-122

G.3 Bird families identified within Beaudry Natural Provincial Park during the Spring and Summer of 1977

Family Name	Commom Name	Total Number of Species
Gaviidae	Loons	1
Podicipedidae	Grebes	1
Phalacrocoracidae	Cormorants	1
Ardeidae	Herons and Bitterns	2
Anatidae	Swans, Geese, Ducks	9
Accipitridae	Kites and Hawks	4
Falconidae	Falcons	1
Tetraonidae	Grouse and Ptarmigan	1
Gruidae	Cranes	1
Rallidae	Rails, Gallinule,and Coots	2
Haematopodidae	Oystercatchers	1
Scolopacidae	Woodcock, Snipe, and Sandpipers	1
Laridae	Gulls and Terns	5
Columbidae	Pigeons and Doves	2
Cuculidae	Cuckoos, Roadrunners, and Anis	1
Strigidae	Typical Owls	3
Caprimulgidae	Goatsuckers	1
Trochilidae	Tyrant Flycatchers	7
Alcedinidae	Kingfishers	1
Picidae	Woodpeckers	5
Tyrannidae	Tyrant Flycatchers	7
Alaudidae	Larks	1
Hirundinidae	Swallows	6
Corvidae	Jays, Magpies,and Crows	2
Paridae	Titmice, Verdins, Bushtits	1
Sittidae	Nuthatches	1
Troglodytidae	Wrens	1
Mimidae	Mockingbirds and Thrashers	2
Turdidae	Thrushes, Solitaires, Bluebirds	2
Bombycillidae	Waxwings	1
Sturnidae	Starlings	1
Vireonidae	Vireos	4
Parulidae	Wood Warblers	6
Ploceidae	Weaver Finches	1
Icteridae	Meadowlarks, Blackbirds,and Orioles	8
Fringillidae	Grosbeaks, Finches, Sparrows, and Buntings	7
	Total	95

G.4 Bird species identified within Beaudry Natural Provincial Park during the Spring and Summer of 1977, and their Status within the Park. Species marked with an asterisk (*) are summer residents; species marked with an apostrophe (') are migrants; and species marked with a circle (°) are known winter residents. (R) designates that this species was identified in the Park on a limited number of occasions (usually only once).

Common Name	Scientific Name
Family Gaviidae (Loons)	
Common Loon ' (R)	Gavia immer (Brünnich)
Family Podicipedidae (Grebes)	
Pied-Billed Grebe ' (R)	Podilymbus podiceps (Linnaeus)
Family Phalacrocoracidae (Cormorants)	
Double-Crested Cormorant '	Phalacrocorax auritus (Lesson)
Family Ardeidae (Herons and Bitterns)	
Great Blue Heron *	Ardea herodias Linnaeus
American Bittern * (R)	Botaurus lentiginosus (Rackett)
Family Anatidae (Swans,Geese,and Ducks)	
Canada Goose '	Branta canadensis (Linnaeus)
Mallard *	Anas platyrhynchas Linnaeus
Pintail '	Anas acuta Linnaeus
Green-Winged Teal '	Anas carolinensis Gmelin
Blue-Winged Teal '	Anas discors Linnaeus
Wood Duck * (R)	Aix sponsa (Linnaeus)
Ring-Necked Duck ' (R)	Aythya collaris (Donovan)
Lesser Scaup ' (R)	Aytha affinis (Eyton)
Bufflehead ' (R)	Bucephala albeola (Linnaeus)
Family Accipitridae (Kites and Hawks)	
Sharp-Shinned Hawk * (R)	Accipiter striatus Vieillot
Red-Tailed Hawk *	Buteo jamaicensis (Gmelin)
Broad-Winged Hawk *	Buteo platypterus (Vieillot)
Marsh Hawk * (R)	Circus cyaneus (linnaeus)
Family Falconidae (Falcons)	
Sparrow Hawk ' (R)	Falco sparverius Linnaeus
Family Tetraonidae (Grouse and Ptarmigan)	
Sharp-Tailed Grouse ° (R)	Pedioecetes phasianellus (Linnaeus)

Common Name	Scientific Name
Family Gruidae (Cranes)	
Sandhill Crane ' (R)	Grus canadensis (Linnaeus)
Family Rallidae (Rails, Gallinules,and Coots)	
Sora * (R)	Porzana carolina (Linnaeus)
American Coot '	Filia americana Gmelin
Family Haematopodidae (Oystercatchers)	
Killdeer *	Charadrius vociferus Linnaeus
Family Scolopacidae (Woodcock, Snipe, and Sandpipers)	
Spotted Sandpiper *	Acitius macularia (Linnaeus)
Family Laridae (Gulls and Terns)	
Herring Gull ' (R)	Larus argentatus Pontoppidan
Ring-Billed Gull (R)	Larus delawarensis Ord
Franklin's Gull ' (R)	Larus pipixcan Wagler
Common Tern '	Sterna hirundo Linnaeus
Black Tern '(R)	Chlidonias niger (Linnaeus)
Family Columbidae (Pigeons and Doves)	
Rock Dove *	Columba livia Gmelin
Mourning Dove *	Zenaidura macroura (Linnaeus)
Family Cuculidae (Cuckoos,Roadrunners,and Anis)	
Black-Billed Cuckoo *	Coccyzus erythropthalmus (Wilson)
Family Strigidae (Typical Owls)	
Great Horned Owl °	Bubo virginianus (Gmelin)
Great Grey Owl ° (R)	Strix nebulosa Forster
Saw-Whet Owl ° (R)	Aegolius acadicus (Gmelin)
Family Caprimulgidae (Goatsuckers)	
Common Nighthawk ' (R)	Chordeiles minor (Forster)
Family Trochilidae (Hummingbirds)	
Ruby-Throated Hummingbird ' (R)	Archilochus colubris (Linnaeus)
Family Alcedinidae (Kingfishers)	
Belted Kingfisher *	Megaceryle alcyon (Linnaeus)

Common Name	Scientific Name
Family Picidae (Woodpeckers)	
Yellow-Shafted Flicker * (R)	Colaptes auratus (Linnaeus)
Red-Headed Woodpecker * (R)	Melanerpes erythrocephalus (Linnaeus)
Yellow-Bellied Sapsucker ' (R)	Sphyrapicus varius (Linnaeus)
Hairy Woodpecker *	Dendrocopus pubescens (Linnaeus)
Downy Woodpecker *	Dendrocopus pubescens (Linnaeus)
Family Tyrannidae (Tyrant Flycatchers)	
Eastern Kingbird *	Tyrannus tyrannus (Linnaeus)
Great-Crested Flycatcher *	Myiarchus crinitus (Linnaeus)
Eastern Phoebe *	Sayornis phoebe (Latham)
Yellow-Bellied Flycatcher *	Empidonax flaviventrus (Baird and Baird)
Traill's Flycatcher * (R)	Empidonax traillii (Audubon)
Least Flycather *	Empidonax minimus (Baird and Baird)
Eastern Wood Peewee *	Contopus virens (Linnaeus)
Family Alaudidae (Larks)	
Horned Lark * (R)	Eremophila alpestris (Linnaeus)
Family Hirundinidae (Swallows)	
Tree Swallow * (R)	Iridoprocne bicolor (Vieillot)
Bank Swallow *	Riparia riparia (Linnaeus)
Rough-Winged Swallow *	Stelgidopteryx ruficollis (Vieillot)
Barn Swallow *	Hirundo rustica Linnaeus
Cliff Swallow * (R)	Petrochelidon pyrrhonota (Vieillot)
Purple Martin * (R)	Progne subis (Linnaeus)
Family Corvidae (Javs, Magpies, and Crows)	
Blue Jay *	Cyanocitta cristata (Linnaeus)
Commom Crow *	Corvus brachyrhynchos Brehm
Family Paridae (Titmice, Verdins,and Bushtits)	
Black-Capped Chickadee *	Parus atricapillus Linnaeus
Family Sittidae (Nuthatches)	
White-Breasted Nuthatch *	Sitta carolinensis Latham
Family Troglodytidae (Wrens)	
House Wren *	Troglodytes aedon Vieillot
Family Mimidae (Mockingbirds and Thrashers)	
Catbird *	Dumetella carolinensis (Linnaeus)
Brown Thrasher *	Toxostoma rufum (Linnaeus)

Common Name	Scientific Name
Family Turdidae (Thrushes, Solitaires, and Bluebirds)	
American Robin *	Turdus migratorius Linnaeus
Veery *	Hylocichla fuscescens (Stephens)
Family Bombycillidae (Waxwings)	
Cedar Waxwing *	Bombycilla cedrorum Vieillot
Family Sturnidae (Starlings)	
Common Starling *	Sturnus vulgaris Linnaeus
Family Vireonidae (Vireos)	
Yellow-Throated Vireo * (R)	Vireo flavifrons Vieillot
Red-Eyed Vireo *	Vireo olivaceus (Linnaeus)
Philadelphia Vireo * (R)	Vireo philadephicus (Cassin)
Warbling Vireo * (R)	Vireo gilvus (Vieillot)
Family Parulidae (Wood Warblers)	
Tennessee Warbler ' (R)	Vermivora peregrina (Wilson)
Nashville Warbler ' (R)	Vermivora ruficapilla (Wilson)
Yellow Warbler *	Dendroica petechia (Linnaeus)
Chestnut-Sided Warbler ' (R)	Dendroica pensylvanica (Linnaeus)
Ovenbird *	Seiurus aurocapillus (Linnaeus)
Wilson's Warbler ' (R)	Wilsonia pusilla (Wilson)
Family Ploceidae (Weaver Finches)	
House Sparrow°	Passer domesticus (Linnaeus)
Family Icteridae (Meadowlarks, Blackbirds, and Orioles)	
Bobolink *	Dolichonyx oryzivorus (Linnaeus)
Western Meadowlark *	Sturnella neglecta Audubon
Yellow-Headed Blackbird '	Xanthocephalus xanthocephalus (Bonaparte)
Red-Winged Blackbird *	Agelaius phoeniceus (Linnaeus)
Baltimore Oriole *	Icterus galbula (Linnaeus)
Brewer's Blackbird *	Euphagus cyanocephalus (Wagler)
Common Grackle *	Quiscalus quiscula (Linnaeus)
Brown-Headed Cowbird *	Molothrus ater (Boddaert)
Family Fringillidae (Grosbeaks, Finches, Sparrows, and Buntings)	
Rose-Breasted Grosbeak *	Pheucticus ludovicianus (Linnaeus)
American Goldfinch *	Spinus tristis (Linnaeus)
Savannah Sparrow *	Passerculus sandwichensis (Gmelin)
Vesper Sparrow *	Pooecetes gramineus (Gmelin)
Lark Sparrow *	Chondestes grammacus (Say)
Clay-Colored Sparrow *	Spizella pallida (Swainson)
Song Sparrow *	Melospiza melodia (Wilson)

G.5 Mammalian families identified within Beaudry Natural ProvincialPark during the Spring and Summer of 1977

Family Name	Common Name	Total Number of Species
Soricidae	Shrews	?
Leporidae	Rabbits and Hares	1
Sciuridae	Squirrels	8
Castoridae	Beavers	5
Dipodidae	Jumping Mice and Jerboas	1
Canidae	Dogs	1
Procyonidae	Raccoons and Their Allies	3
Cervidae	Deer	1
	Total	20

G.6 Mammal species identified within Beaudry Natural Provincial Park during the Spring and Summer of 1977

Common Name	Scientific Name
Family Soricidae (Shrews)	
Shrew	Sorex sp
Family Leporidae (Rabbits and Hares)	
Eastern Cottontail	Sylvilagus floridanus (J. A. Allen)
Family Sciuridae (Squirrels)	
Eastern Chipmunk	Tamis striatus (Linnaeus)
Least Chipmunk	Eutamis minimus (Bachman)
Woodchuck	Marmota monax (Linnaeus)
Richardson's Ground Squirrel	Spermophilus richardsonii (Sabine)
Thirteen-Lined Ground Squirrel	Spermophilus tridecemlineatus (Mitchell)
Grey Squirrel	Sciurus carolinensis Gmelin
American Red Squirrel	Tamiasciurus hudsonicus (Erxleben)
Northern Flying Squirrel	Glaucomys sabrinus (Shaw)
Family Castoridae (Beavers)	
American Beaver	Castor canadensis Kuhl
Family Muridae (Rats, Mice, and Voles)	
Deer Mouse	Peromyscus maniculatus (Wagner)
Gapper's Red-Backed Vole	Cletrionomys gapperi (Vigors)
Muskrat	Ondata zibethicus (Linnaeus)
Meadow Vole	Microtus pennsylvanicus (Ord)
Family Dipodidae (Jumping Mice and Jerboas)	
Meadow Jumping Mouse	Zapus hudsonicus (Zimmerman)
Family Canadidae (Dogs)	
Red Fox	Vulpes vulpes (Linnaeus)
Family Procyonidae (Raccoons and Their Allies)	
Raccoon	Procyon lotor (Linnaeus)
American Mink	Mustela vison Schreber
Striped Skunk	Mephitis mephitis (Schreber)
Family Cervidae (Deer)	
White-Tailed Deer	Odocoileus virginianus (Zimmerman)

Appendix H

INVENTORY SAMPLING METHODS

H.1 Vegetation Mapping

The vegetation types and their location in Beaudry Provincial Park were tentatively identified through the use of a 1968 composite aerial photograph and the study of 9" x 9" stereopairs of aerial photographs taken in April 1976 (MA999-9 and MA 999-10; scale: inch: 2640 feet) under a stereoscope. A subsequent ground surveillance of the park area led to the confirmation and/or clarification of these identifications and resulted in the production of Map 7.

H.2 Vegetation Sampling Method

The nature of the two basic vegetation divisions of woodland and grassland, and the varying inventory objectives for each necessitated the use of differing methods of vegetation sampling and analysis. As an aid to understanding the results presented and to assess their limitations a complete description of the procedures followed will be presented.

H.2.1 Woodland

H.2.1.1 Introduction

A standardized procedure was followed in the collection of the necessary field data. This procedure entailed:

1. a reconnaissance trip through the woodland to examine the species complement, homogeneity, and degree of past disturbance by man;
2. the choice of a representative location in the area for vegetation study; and
3. the systematic, ie., non-random establishment of a number of one-tenth acre (400 m^2) sampling plots for the analysis of trees,

shrubs and ground cover.

The choice of the area to study is more likely to affect the results than any other factor. There is no feasible means by which this subjective judgement can be completely avoided (Curtis, 1959). In an effort to minimize this influence the following criteria were used in the selection of the location for intensive vegetation study within each woodland area chosen:

1. it should be located at least 50 m. from any border, whether the Assiniboine River or another vegetation type, and the remaining forest (i.e., exclusive of the border) should cover an area of 15 acres (37 ha.);
2. it should be located upon a uniform topographic unit;
3. it should exhibit homogeneity i.e., a uniform distribution of species characteristic of the vegetation type throughout the area; and
4. it should be free from serious disturbances such as grazing and logging (excluding sanitary measures such as the Dutch Elm Disease Erradication Program).

H.2.1.2 Woodland Sampling Procedure

The sampling plot, a one-tenth acre square quadrat (20 m. x 20 m.) was constructed with a measured rope and Silva compass for the analysis of trees, shrubs and groundcover. The field data necessary for the derivation of quantitative estimates of the population size and structure of the tree stratum of each region were the species, number and diameter at breast height (dbh) of each tree in the sample plots taken in that region. This data was collected by enumeration. In this procedure, trees, defined as woody stems equal to or greater than 3.0 inches (7.62 cm.) in diameter at breast height (4.5 feet or 1.3 meters above the ground) in the

sample plot were counted and identified by species as well as measured for diameter at breast height. The basal area of each tree was calculated from the measurement of diameter at breast height.

The number of sample plots taken in an area corresponded to its size and the number of sample plots required to survey a large number of individual trees in general; a statistical test of the minimum number of sample plots per region required was not conducted. The locations of the sample plots were chosen systematically in an attempt to achieve an even spacing of plots throughout the stand. Fourteen sample plots were taken in the Sair Riverbottom, the Jail Riverbottom, and the Beaudry Riverbottom Forests. Six sample plots were taken in the Beaudry Aspen Forest and thirteen were taken in the Beaudry Oak Forest. The locations of the sample plots in each of the above regions are given in Map 15.

The data obtained from the areal sampling method described above was summarized by the calculation of dominance, density, and frequency for each species. The relative values for dominance, density and frequency were calculated and then summed into a single Importance Value which reflects these different measures of the importance of the species in a community. These various vegetational measurements were calculated from the following formulas:

$$\text{density} = \frac{\text{number of individuals}}{\text{area sampled}}$$

$$\text{relative density} = \frac{\text{density for a species}}{\text{total density for all species}} \times 100$$

$$\text{basal area} = \frac{\text{diameter at breast height}^2}{2}$$

$$\text{dominance} = \frac{\text{total basal area}}{\text{area sampled}}$$

$$\text{relative dominance} = \frac{\text{dominance for a species}}{\text{total dominance for all species}} \times 100$$

$$\text{frequency} = \frac{\text{number of plots in which species occurs}}{\text{total number of plots sampled}}$$

$$\text{relative frequency} = \frac{\text{frequency value for a species}}{\text{total of frequency value for all species}} \times 100$$

importance value = relative density + relative dominance + relative frequency.

The canopy height of ten percent (10%) of the trees present in a sample plot were determined through their measurement with a Hagar clinometer and the measurement of the horizontal distance between the spot of Hagar measurement and the tree. The Hagar values and this horizontal distance were used to calculate the tree's height according to the following formula:

$$\text{total height} = \frac{\text{Hagar value at tree top} - \text{Hagar value at tree bottom} \times}{\text{horizontal distance to tree} \times \frac{1}{100}}$$

To analyze shrubs[1], two one meter wide transects were made across the sample plot. The number of woody stems less than 3.0 inches (7.62 cm) in diameter intercepted at breast height (4.5 feet or 1.3 meters) were counted and recorded by species. The total number of shrub stems of each species counted in the two transects of each sample plot were used to calculate the shrub stems per hectare, the relative density, and the relative frequency for each shrub species for each woodland area sampled. For example, the values obtained from twelve transects (6 x 2) in the Beaudry Aspen Forest, twenty-eight transects (14 x 2) in the Beaudry, Sair and Jail riverbottom Forests, and twenty-six transects (13 x 2) in the Beaudry Oak Forest were used to calculate the measurements mentioned above. The relative density and the relative frequency for each species was summed to arrive at the Importance Value for each species of shrub.

To analyze the herbaceous layer, quadrats were thrown at random within

[1] Shrubs include any woody lianas intercepted at breast height.

each of the tree sample plots. The size of the quadrat and the number of times it was thrown was dependent upon the size and the number of herb species present in a particular study region (as well as the time available). Again, the quadrat size and the number per sample plot were not determined by statistical means. Forty (40) ½ m^2 quadrats were thrown at random within the tree and shrub sample plots established in the Beaudry Oak Forest. Twenty (20) 1 m^2 quadrats were thrown at random within the sample plots established in the Beaudry Aspen, the Beaudry Riverbottom, the Sair Riverbottom, and the Jail Riverbottom Forests. In each quadrat, the species present were recorded and assigned a cover value from one to five according to a modified version of the cover-abundance scale established by Braun-Blanquet (Phillips, 1959) given in Table 24.

Table 24. Cover by the Braun-Blanquet Cover-Abundance Scale

Cover Value	Description	Coverage
1	Single individual	
2	Isolated Invididuals	
3	Scattered plants	20-50%
4	Plants common	50-75%
5	Plants very abundant	75-100%

Through this method the mean cover value for each species sampled in one sample plot was calculated. These values per species for each sample plot in the area were summed and then divided by the total number of sample plots in that forest. This resulted in the determination of the mean cover value for each herb species sampled in that forest. The value of this mean species cover value per forest relative to the other species,

sampled in the forest's herbaceous layer, i.e., the relative cover value per forest was calculated. This relative value was used as a measure of a species ecological importance and therefore, is equated to the Importance Value determine for trees and shrubs.

H.2.2 Grassland

Grassland-Sampling Procedure

The Retention Pond Prairie was surveyed every seven to fourteen days beginning in June, 1977. The final survey was August 6, 1977. In this survey, the floral species present and their state of phenology were recorded. Five stages of phenology were delimited: seedling, vegetative, budding, flowering, and fruiting.[1] This data was summarized into a Phenological Record in the form of the flowering dates of the major forbs present, and included in a Record of Flowering Dates for some Plants of Beaudry Provincial Park (see Appendix I).

H.3 Small Mammal Sampling Method

H.3.1 Introduction

The objective of small mammal trapping was to determine the composition and relative abundance of small mammal populations in the major Vegetation Types of Beaudry Provincial Park. The specific areas of Beaudry Park chosen for small mammal trapping are listed in Table 25 and illustrated in Map 16. Intensive small mammal trapping, where a sampling area was established for three consecutive nights, was initiated August 6, 1977 and concluded August 16, 1977. It was hoped that the three successive trap-nights characteristic of this method would result in the capture of the less common and rare small mammal species inhabiting the particular

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[1] This phenological classification was adopted for a Vegetation Survey in Assiniboine Forest, one of Winnipeg's Natural Urban Parks (see Evans, 1975:7).

Vegetation Type under investigation. Intensive trapping was carried out in five forest areas identified in Table 25 as Beaudry, Sair, and Jail riverbottom forests and the Beaudry Aspen Forest and the Beaudry Oak forest, as well as in a small areas of tall grass prairie designated as the Retention Pond Prairie. The small mammal inventory of Beaudry Provincial Park accomplished through intensive small mammal trapping was restricted to the above areas due to time, manpower, equipment and weather constraints. Less intensive trapping, where a sampling area was established for a single night was carried out in the remaining areas listed in Table 25: Inactive Streambed and Upland Shrub Meadow. Through the system of intensive and less intensive small mammal trapping, the small mammal populations of those areas and Vegetation Types considered significant for the park's wildlife resource were sampled.

H.3.2 Small Mammal Trapping Procedure

H.3.2.1 Introduction

In general whether trapping was intensive or less intensive, the sampling area was a gridded rectangular plot. The following standard procedure was adhered to in all the small mammal trapping sampling areas. One Museum Special Snap Trap baited with a mixture of peanut butter, oatmeal, breakfast cereal, flour and bacon grease was placed at each intersection of the lines and rows of the grid produced in the construction of the plot. The traps were checked the following morning. The species of small mammals caught were conditionally identified andthe number of individuals of the various species noted. The small mammals were then frozen and subsequently given to the Museum of Man and Nature, Winnipeg, Manitoba for final identification and preservation.[1] The procedure followed in each vegetation type is described in the following sections.

[1] As of March 1, 1978, the Museum of Man and Nature has not identified the small mammals caught during the summer of 1977.

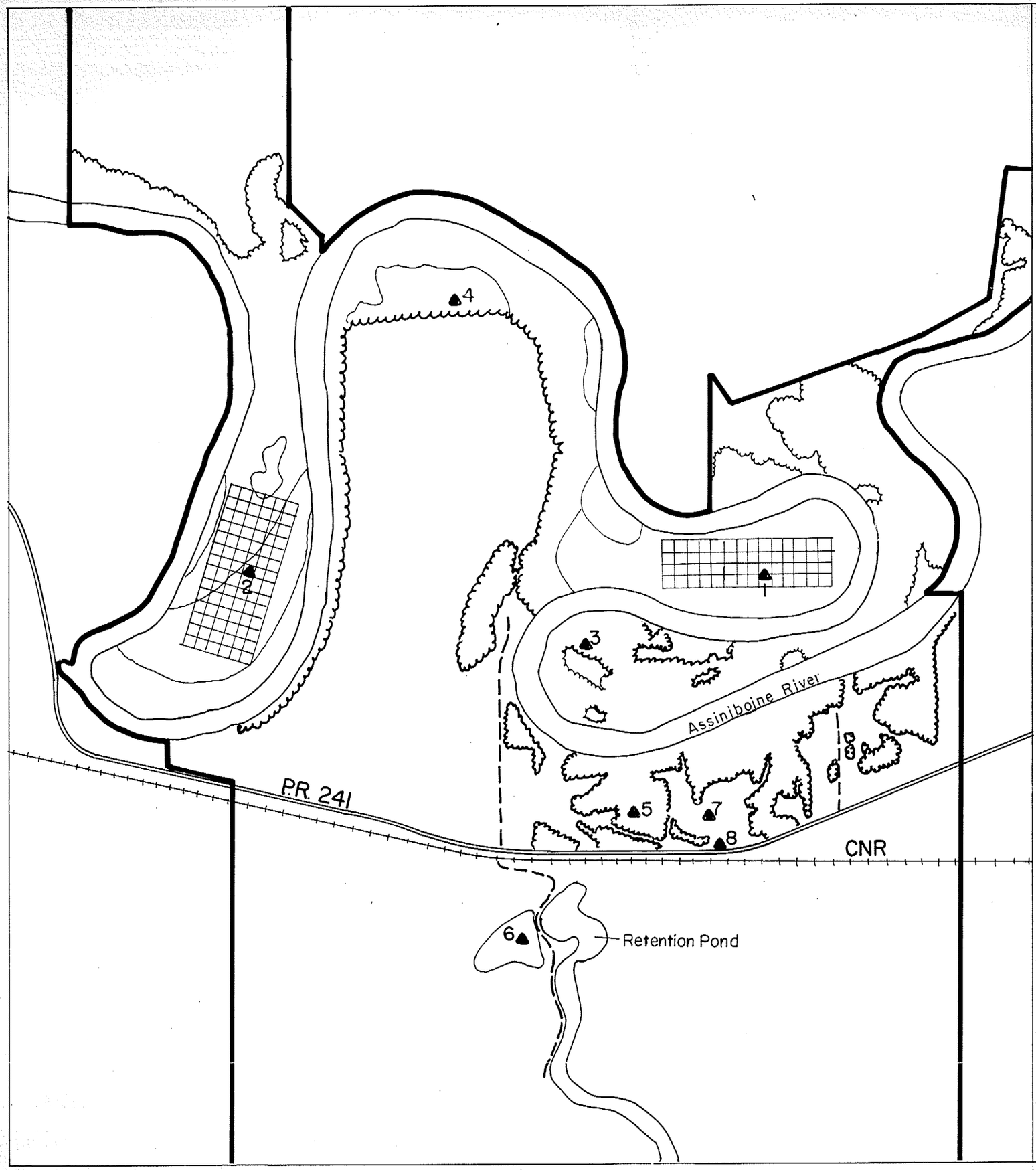
Table 25. Small Mammal Trapping Areas of Beaudry Provincial Park and their Vegetation Type.

Vegetation Type	Area of Beaudry Provincial Park
WOODLAND	
Riverbottom Forest	Beaudry Riverbottom Forest*
	Sair Riverbottom Forest*
	Jail Riverbottom Forest
Aspen Forest	Beaudry Aspen Forest
Oak Forest	Beaudry Oak Forest
GRASSLAND	
Prairie	Retention Pond Prairie
Inactive Streambed	Inactive Streambed
Disturbed Prairie	Upland Shrub Meadow

* The small mammal trapping plot was located within the Breeding-Bird Census plot located here.

MAP 16

The location of breeding-bird census plots and small mammal trapping plots in the vegetation types of Beaudry Provincial Park



- Breeding-bird census plot
- ▲ Small mammal trapping plot
- 1 Beaudry riverbottom forest
- 2 Sair riverbottom forest
- 3 Jail riverbottom forest
- 4 Beaudry aspen forest
- 5 Beaudry oak forest
- 6 Retention pond prairie
- 7 Inactive streambed
- 8 Upland shrub meadow

Limit of Park Lands

Unpaved Roads

NORTH

100 0 500 1000
metres

H.3.2.2 Intensive Small Mammal Trapping

Woodland

Since each of the forest areas (Beaudry, Sair and Jail[1] river-bottom Forests, Beaudry Aspen and Beaudry Oak Forest) consisted of a relatively extensive area, the small mammal sampling area for each was chosen to extend over 0.44 hectares. The sampling area was marked out by a grid of ten rows and nine lines spaced 7 m. apart. This grid was placed in an area of each forest which could be considered representative of its particular vegetation type. Since one baited Museum Special Snap Trap was placed at each intersection of the lines and rows, a total of ninety (90) snap traps were used per sampling area. The location of each small mammal trapping area is indicated in Map 16.

Grassland

An 0.08 ha (784 m^2) small mammal sampling plot with 4 x 4 trapping points situated 7 m. apart was marked out in the small area of tall grass prairie identified as the Retention Pond Prairie on Figure 17. The sixteen Museum Special Snap Traps used in this area where checked in the late morning for four (4) consecutive days.

H.3.2.3 Less Intensive Small Mammal Trapping

Inactive Streambed

A rectangular sampling area extending over 0.08 ha (784 m^2) with sixteen (16) trapping points spaced 7 m. apart was marked out across the area identified as the Inactive Streambed in Table 25 and illustrated in Map 16. This sampling area basically consisted of two transects lines (eight trapping points each) running across a number of seral stages characteristic of the inactive streambed (willow, sedge and grasses, rose).

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[1] Traps were only set for two nights in the Jail Riverbottom Forest due to prevailing weather conditions.

The sixteen traps were baited and set in the afternoon of August 20, 1977 and checked and collected the following morning.

Upland Shrub Meadow

A rectangular sampling plot extending over 0.05 ha (490 m^2) was established in this vegetation type. The plot consisted of two lines of five trapping points spaced 7 m. apart. Ten (10) Museum Special Snap Traps were set in the afternoon of August 20, 1977 and checked and collected the following morning.

H.4 Breeding-Bird Census Method

The breeding bird-censusing procedures suggested by Hall (1964) were followed in the bird censuses conducted in Beaudry Provincial Park. As suggested by Hall, the areas chosen as the locations for bird-census plots were of a "single uniform environmental type" with an area greater than twenty (20) acres. Two areas were chosen: the Beaudry Riverbottom Forest and the Sair Riverbottom Forest.

Parallel census lines were laid out in both areas prior to the breeding season with the use of a Silva compass and a measured rope (50 m.). The resulting breeding-bird census plot was a rectangular grid. The dimensions of the Beaudry breeding-bird census plot were 200 m x 700 m, the dimensions of the Sair Breeding-Bird Census Plot were 300 m x 700 m. Map 16 illustrates the location and dimensions of these respective bird-census plots.

Consequent to the "birder's" familiarization with the songs of those bird species inhabiting the two chosen study areas, breeding-bird censusing was initiated. Ten census trips were taken between 0800 and 1300 hours, CDT, in each plot. The coverage dates for each plot are given in the Summary of Breeding-Bird Plots (Appendix I).

The approximate locations of singing birds for each trip (mapped on a field map) were transposed onto a separate map for each species. The approximate territories were then outlined using the clusters of dots (dot = location of singing bird) and the information on birds singing simultaneously. It should be noted that the purpose of the census was not to outline the precise territories, rather to determine the number of territories present (Hall, 1964). The results of the breeding-bird censuses are given in Appendix I in a slightly modified version of the format recommended by Van Velzein (1972).

Appendix I

INVENTORY DATA

I.1 Flowering Dates for Some Plants of Beaudry Provincial Park*

Species	First Bloom Observed	Latest Bloom Observed
Starry False Solomon's Seal *Smilacina stellata* L. Desf.	May 9	June 20
Nodding Trillium *Trillium cernuum* L	May 12	June 5
White Baneberry *Actaea rubra forma neglecta* (Gillman) Robins	May 15	June 7
Hoary Puccoon *Lithospermum canascens* (Michx) Lehm.	May 16	June 25
Wild Lily-of-the-Valley *Maianthemum canadense* var. *interius* Fern.	May 17	June 11
Silverweed *Potentilla anserina* L.	May 18	
Three Flowered Avens *Geum triflorum* Pursh.	May 24	June 10
Canada Anenome *Anemone canadensis* L.	May 30	July 17
Downy Arrow-wood *Viburnum rafinesquianum* Schultes.	May 30	June 9
Northern Bedstraw *Galium septentrionale* R + S	May 31	July 10
Blue-Eyed Grass *Sisyrinchium montanum* Greene	May 31	August 17
Comandra *Comandra richardsonii* Fern.	May 31	June 11

*This list was originally compiled by Shelley McCready.

Species	First Bloom Observed	Latest Bloom Observed
Dwarf Milkweed *Asclepias ovalifolia* Dcne.	May 31	June 20
Alumroot *Heuchera richardsonii* R. Br.	May 31	June 27
Fragrant False Indigo *Amorpha nana* Nutt.	June 1	June 10
Small Yellow Lady's-Slipper *Cypripedium calceolus* L. var. *parviflorum* (Salisb.) Fern.	June 2	June 15
Spreading Dogbane *Apocynum androsaemifolium* L.	June 2	June 28
Wild Columbine *Aquileqia canadensis* L.	June 2	June 20
Grove Sandwort *Arenaria lateriflora* L.	June 2	July 5
Black Snakeroot *Sanicula marilandica* L.	June 2	June 14
Bladder Campion *Silene cucbalus* Wibel	June 3	July 29
Vetchling* *Lathyrus venosus* var. *intonsus* Butt + St. John	June 3	July 6
Solomon's Seal[1] *Polygonatum canliculatum* (Muhl.) Pursh.	June 4	June 12
Beggarticks *Bidens frondosa* L.	June 5	August 25
Wolfberry *Symphoricarpus occidentalis* Hook	June 6	July 15
Smooth Hedge-nettle *Stachys tenuifolia* Willd. var. *hispida* (Pursh) Fern.	June 8	August ?

* This vetchling is also commonly known as Wild Peavine.
1 This forb is also commonly known as Great Solomon's Seal.

Species	First Bloom Observed	Latest Bloom Observed
Meadow-Sweet *Spiraea alba* Du Roi	June 8	August 1
Hedge Bindweed *Convolvulus sepium* L.	June 8	August 25
Common Yarrow *Achilla millefolium* L.	June 8	August 11
Harebell *Campanula rotundifolia* L.	June 11	August 21
Thimbleweed *Anemone cylindrica* Gray	June 11	July 2
Wild Licorice *Gycyrrhiza lepidota* (Nutt.) Pursh	June 19	August 15
Black-Eyed Susan *Rudbeckia serotina* Nutt.	June 19	August 6
Jerusaleum Artichoke *Helianthus tuberosus* L. var. *subcanescens* Gray	June 19	July 5
Spotted Coralroot *Corallorrhiza maculata* Raf.	June 24	July 7
Spiny-Leaved Sow Thistle *Sonchus asper* (L.)	June 27	August 25
False Dandelion *Agoseris glauca* (Nutt.) Greene	July 1	August 16
Fireweed *Epilobium angustifolium* L.	July 3	?
Water Plantain *Sagittaria latifolia* Willd.	July 3	August 11
Wild Bergamont *Monarda fistulosa* L.	July 4	August 15
Maddog Skullcap *Scutellaria lateriflora* L.	July 4	July 20
Lopseed *Phryma leptostachya* L.	July 5	?

Species	First Bloom Observed	Latest Bloom Observed
Mint *Mentha arvensis* L. var. *villosa* (Benth.)	July 5	August 25 (?)
Common Motherwort *Leonurus cardiaca* L.	July 6	?
Sunflower* *Helianthus maximiliani* Schrad	July 6	August 25
Brook Cinquefoil *Potentilla millegrana* Engelm	July 7	August 1
Swamp Smartweed *Polygonum coccineum* Muhl.	July 7	August 25
Water Plantain *Alisma triviale* Pursh.	July 7	August 11
Goldenrod[1] *Solidago canadensis* L.	July 8	August 16
Green-Headed Coneflower *Rudbeckia laciniata* L.	July 9	August 25
Purple Prairie Clover *Petalostemum purpureum* (Vent) Rydb.	July 9	July 28
Sunflower[2] *Helianthus laetiflorus* Pers. var. *rigidus* (Cass) Fern.	July 8	August 2
Curlycup-Gumweed *Grindelia squarrosa* (Pursh) Dural	July 12	August 25
Aster[3] *Aster pansus* (Blake) Cronq	July 12	August 16
Water Parsnip *Sium suave* Walt.	July 12	?
Giant Blue Hyssop *Agastache foeniculum* (Pursh) Ktze.	July 13	July 25

* This sunflower is also commonly known as Narrow-Leaved Sunflower.
1 This goldenrod is also commonly known as Hard-Leaved Goldenrod.
2 This sunflower is also commonly known as Showy Sunflower.
3 This aster is also commonly known as Many Flowered Aster.

Species	First Bloom Observed	Latest Bloom Observed
Bicknell's Cranesbill *Geranium bicknellii* Britt.	July 13	August ?
Indian-Pipe *Monotropa uniflora* L.	July 17	
Wild Onion *Allium syellatum* Fraser	July 17	August 10
Blazing-star *Liatrus liqulistylis* (Nels) K. Schum	July 17	August 16
Goldenrod* *Solidago rigida* L.	July 18	August 16
Hawkweed *Hieracium umbellatum* L.	July 20	?
Goldenrod *Solidago mollis* Bartl.	July 25	?
White Lettuce *Prenanthes albus* L.	August 4	?
Closed Gentian *Gentiana andrewsii* Griseb.	August 10	?

* This goldenrod is also known as Hard leaved Goldenrod.

I.2 Summary of Breeding-Bird Censuses

I.2.1 Beaudry Riverbottom Forest Breeding-Bird Census

Location: Beaudry Meander Peninsula of Beaudry Natural Provincial Park (see Map 16), Headingley, Manitoba.

Size: 14 ha (34.6 acres); (200 m N-S by 700 E-W, 50 m grid laid out with a compass and measured rope (50 m).

Description of Plot: The dominant canopy trees are green ash (Fraxinus pennsylvanica), Basswood (Tilia americana), American elm (Ulmus americana), and Manitoba maple (Acer negundo). The dominant shrub understory consists of Green ash, Beaked Hazelnut (Corylus cornuta) and Red Osier Dogwood (Cornus stolonifera). The dominant ground cover species are Ostrich-Fern (Matteuccia struthiopteris), Poison Ivy (Rhus radicans) Wild Sarsaparilla (Aralia nudicaulis), and Riverbank Grape (Vitis riparia)[1]. Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957. Ground cover 85%; canopy cover 90%; average canopy height 20 m (66 feet) (range 16-23 m).

Edge: The plot is located in a 40 ha wooded meander peninsula of the Assiniboine River. At several locations the north and south boundaries of the plot come within 100 m of the riverbanks. Uniform habitat exists throughout the peninsula with the exception of riverbanks covered with a dominant willow (Salix sp) thicket.

Topography: Essentially level with the exception of some small ridges or meander scrolls (less than 1.2 m in height).

Elevation: Approximately 770 feet above sea level.

Weather: Generally cloudy with occassional rain but not above normal precipitation. Temperatures averaged a few degrees below normal.

Coverage: The dates of census were June 2, 4, 5, 6, 9, 12, 14, 16, 18, 19. All trips were between 0500 and 1300 hours, CDT. Total number of man-hours devoted to censusing was 24.

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[1] A quantitative botanical analysis of the plot area is provided in the discussion of the Vegetation of Beaudry Natural Provincial Park.

Census: Least Flycatcher, 19(136, 55); Nothern Oriole, 13(93,43); American Robin, 7(50, 26); Rose-Breasted Grosbeak, 6.5 (46, 19); Great-Created Flycatcher, 3.5(25, 10); Eastern Wood Peewee, 3.5(25, 10); Red-Eyed Vireo, 3.5(25, 10); Warbling Vireo, 3.5(25, 10); Yellow-Throated Vireo, 2; Black-Capped Chickadee, 1; Veery, 1; Philadelphia Vireo, 1; Broad-Winged Hawk, +; Mourning Dove, +; Black-Billed Cuckoo, +; Hairy Woodpecker, +; Downy Woodpecker, +: Blue Jay, +; White-Breasted Nuthatch, +; Yellow Warbler, +; Brown-Headed Cowbird, +.

Total: 21 species; 65 territorial males or females (464/km^2, 187 per 100 acres) .

Visitors: Red-Tailed Hawk, Yellow-Bellied Sapsucker, Eastern Pheobe, Alder Flycatcher, Common Crow, Gray Catbird, Cedar Waxwing.

Remarks: Two American Robin nests were found and later predated as was one Black-Billed Cuckoo nest. One family of fledged American Robins were observed in the area as were families of Blue Jays, Black-Capped Chickadees, White-Breasted Nuthatches and Hairy Woodpeckers. Least Flycatchers were localized and did not appear to be present where Green Ash dominated. The Northern Orioles appeared to be associated with large trees reasonably close to the water and were not common in the centre of the peninsula. Rose-Breasted Grosbeaks were more commonly found toward the interior of the plot.

I.2.2 Sair Riverbottom Forest Breeding-Bird Census

Location: Sair Meander Peninsula of Beaudry Natural Provincial Park (see Map 16); Headingley, Manitoba.

Size: 21 ha (51,9) (700 m NW-SE by 300 m ES_WN, 50 m grid laid out with a compass and measured rope).

Description of Plot: The dominant canopy trees are Green Ash (Fraxinus pennsylvanica), American elm (Ulmus americana), Basswood (Tilia americana), and Manitoba maple (Acer negundo). The dominant shrub understory consists of Beaked Hazelnut (Corylus cornuta), Green Ash, and Moonseed (Menispermum canadense). The dominant ground cover species are Poison Ivy (Rhus radicans), Moonseed, Wood Nettle (Laportea canadensis), and Ostrich-Fern (Matteuccia struthiopteris)[1]. Botanical names are from H. J. Scoggan, Flora of Manitoba, Nat. Mus. Canada, Bull. No. 140, 1957. Ground cover 85%; canopy cover 90%; average canopy height 21 m (68 feet) (range: 14-27 m).

Edge: The plot is located in a 55 ha wooded meander peninsula of the Assiniboine River. The northern and southern boundaries of the plot come within 100 m of the river bank in several locations. Uniform habitat exists throughout the peninsula with the exception of dominant willow (Salix sp) thickets on the edge of some of the river bank.

Topography: Essentially level with the exception of small ridges or meander scrolls (less than 1.2 m in height).

Elevation: Approximately 770 feet above sea level.

Weather: Generally overcast. Temperatures averaged a few degrees below normal.

Coverage: The dates of census were May 27 and May 31, June 1, 2, 8, 22, 24, 28, 29, 30. All trips were between 0500 and 1300 hours, CDT. Total number of man-hours devoted to censusing was 30.

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[1] A quantitative botanical analysis of the plot area is provided in the discussion of the Vegetation of Beaudry Provincial Park.

Census: Least Flycatcher, 6.5(31, 12); Eastern Wood Peewee, 4.5 4.5(21, 9); Baltimore Oriole, 4.5(21,9); Great Creasted Flycatcher, 3(14, 6); Red-Eyed Vireo, 3(14, 6); American Robin, 2.5; Rose-Breasted Grosbeak, 2.5; Warbling Vireo, 2; House Wren, 1; Yellow Warbler, 0.5; Hairy Woodpecker, +.

Total: 11 species; 30 territorial males or females (142/km^2, 58 per 100 acres).

Visitors: Ovenbird, Broad-Winged Hawk, Eastern Pheobe, White-Breasted Nuthatch, Veery, and Philadelphia Vireo.

Remarks: A Yellow Warbler nest was found in a hazelnut thicket just outside the plot. One family of fledged Hairy Woodpeckers were observed in the plot. A Dutch Elm Disease Erradication Program in this meander peninsula resulted in the disturbance of the bird species populating this area. Extensive burning of deadwood piles on June 8 and June 9, 1977 occurred in the Bird-Census Plot. Consequent disturbances to the bird populations during the censusing period were created by large machinery extinquishing the fires and work crews and machinery as a result of the continuation of the elm sanitation program. Warbling Vireos heard prior to June 9, 1977 were not heard thereafter. This may be related to the affects of the Dutch Elm Disease Sanitation Program.

I.3 Record of Some Wildlife Species Sighted: Summer, 1977

I.3.1 Record of Some Bird Species Sighted

Species	Date of Observation	Area of Observation	Number Observed
Double-Creasted Cormorant	May 12	Retention Pond	1
	August 7	Retention Pond	4
	August 8	Retention Pond	2
	August 10	Retention Pond	6
	August 6	Retention Pond	6
Great Blue Heron	June 5	Jail Meander Point	1
	June 7	Jail Meander Point	1
	July 7	Jail Meander Point	1
	August 10	Wildlife Pond	1
	August 10	Rock in Assiniboine River	1
	August 17	Retention Pond	2
	August 27	Rock in Assiniboine River	1
	September 6	Retention Pond	1
Canada Goose	May 12	Bend of Beaudry Property	1
	May 16	Bend of Beaudry Property	4
Mallard	April 30	Assiniboine River	2 (pair)
	May 12	Bend of Beaudry Property	4
	May 16	Retention Pond	4 (2 pairs)
	June 2	Beach of Jail Property	3
	June 5	Assiniboine River	2 (pair)
	June 8	Sandbar in Assiniboine River	30 (brood)
	June 21	Beach of Jail Property	5
Green-Winged Teal	May 2	Retention Pond	1
	May 12	Bend of Beaudry Property	4
	June 8	Beach of the Jail Property	
Blue-Winged Teal	September 6	Assiniboine River	1
		Retention Pond	1
Wood Duck	April 30	Near Bend of Beaudry Property	1
Bufflehead	May 2	Retention Pond	1
Common Tern	May 2	Retention Pond	5
	August 10	Retention Pond	5
	August 30	Retention Pond	5
Sharp-Shinned Hawk	June 7	Assiniboine River	1
Red-Tailed Hawk	April 30	Sair Property	1
	May 12	Bend of Beaudry Property	1
	June 1	Assiniboine Riverbank	1
	June 2	Retention Pond	1
	August 17	Beaudry Property	1
	August 20	Retention pond	1
	August 30	Retention Pond	4
Broad-Winged Hawk	July 7	Beaudry Property	1
	August 6	Beaudry Property	1
	August 21	Beaudry Property	4
	August 28	Beaudry Property Field	3
Sharp-Tailed Hawk	September 17	Beaudry Property	1
Sandhill Crane	August 21	Beaudry Property Field	2
Black-Billed Cuckoo	June 5	Beaudry Property Bird Census Plot	1
		Beaudry Property at Riverbank	1

Species	Date of Observation	Area of Observation	Number Observed
Great Gray Owl	July 20	Sair Riverbottom Forest	1
Saw-Whet Owl	May 2	Beaudry Riverbottom Forest	1
Belted Kingfisher	June 7	Assiniboine River	1
	August 10	Retention Pond	1
	August 12	Retention Pond	1
Horned Lark	May 27	Beaudry Property Field	1
Cliff Swallow	June 8	Assiniboine River	2
Bobolink	June 2	Beaudry Property Field	2
Yellow-Billed Cuckoo ?	June 11	Beaudry Property Near River	1

I.3.2 Record of Some Mammal Species Sighted

Species	Date of Observation	Area of Observation	Number Observed
Eastern Cottontail	June 6	Prairie at Abandoned Railway	1
	June 24	Beaudry Oak Forest	1
American Beaver	May 2	Retention Pond	1
	May 10	Beach of Jail Property	2
	May 11	Beach of Jail Property	3
	May 31	Beach of Jail Property	2
	June 5	Beaudry Biverbottom Forest Riverbank	2
	July	Beaudry Meander Point	2
	July 16	Beach of Jail Property	2
	July 17	Beach of Jail Property	2
	July 18	Beach of Jail Property	2
	July 19	Beach of Jail Property	2
	August 20	Beach of Jail Property	3
Red Fox	June 2	Stream Through Beaudry Property	1
	June 6	Jail Meander Point	1
Raccoon	May 25	Perrin House	1
	May 31	Beach of the Jail Property	1
	June 6	Jail Meander Point	2
	August 17	Beaudry Property Riverbank	2
American Mink	May 11	Willow Thicket - Beaudry Riverbank	1
Stiped Skunk	May 18	Beaudry Riverbottom Forest	1
	August 6	Perrin House	1
White-Tailed Deer	May 10	Beach of Jail Property	2
	May	Stream Through Beaudry Property	5
	May 11	Jail Meander Point	5
	May 24	Beaudry Aspen Forest	2
	May	Jail Meander Point	
	June 7	Jail Meander Point	3
	June 11	Beaudry Oak Forest-Opening	2 (1 fawn)
	June 24	Sair Property Field	2
	July 17	Beaudry Aspen Forest	1
	August 6	Beaudry Bird-Census Plot	3
	August 11	Jail Riverbottom Forest	3
	August 17	Beaudry Property Field	2
	August 20	Beaudry Property Field	6
		Jail Meander Point	2
	September 6	Beaudry Property Field	4
	September 30	Beaudry Property Field	7

I.4 Summary of the Tree Sampling Data

I.4.1 The Number of Trees per Sample Plot, Trees per Hectare, Total Basal Area, Relative Density, Relative Dominance, and Importance Values of Each Tree Species Sampled in the Sample Plots located in the Beaudry Riverbottom Forest

Sample Plot Number	Species*	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
1	Basswood	26	642	1.65	72	93	165
	Elm	7	173	0.05	19	3	22
	Oak	2	49	0.07	6	4	10
	Maple	1	25	0.01	3	1	3
	Total	36	889	1.78	100	100	200
2	Elm	6	148	0.44	25	59	84
	Ash	11	272	0.18	46	24	70
	Maple	4	99	0.05	17	7	24
	Oak	3	74	0.08	12	10	22
	Total	24	593	0.75	100	100	200
3	Basswood	5	124	0.53	17	57	74
	Ash	13	321	0.13	43	14	57
	Elm	6	148	0.23	20	25	45
	Maple	4	99	0.03	13	3	16
	Oak	1	25	0.007	3	1	4
	Willow	1	25	0.004	3	1	4
	Total	30	742	0.931	99	101	200
4	Ash	19	469	0.17	50	22	72
	Basswood	7	173	0.23	18	30	48
	Oak	8	198	0.15	21	20	41
	Elm	1	25	0.18	3	24	27
	Maple	3	74	0.03	8	4	12
	Total	38	939	0.76	100	100	200
5	Oak	3	74	0.36	11	68	79
	Basswood	15	371	0.11	56	21	77
	Ash	8	198	0,05	30	9	39
	Maple	1	25	0.01	4	2	m 6
	Total	27	668	0.53	101	100	200
6	Ash	12	297	0.21	60	39	99
	Maple	5	124	0.08	25	15	40
	Oak	1	25	0.09	5	17	22
	Elm	1	25	0.08	5	15	20
	Basswood	1	25	0.08	5	15	20
	Total	20	496	0.54	100	101	201

Sample Plot Number	Species*	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
7	Elm	3	74	0.77	16	72	88
	Ash	12	297	0.26	63	24	87
	Maple	4	99	0.04	21	4	25
	Total	19	470	1.07	100	100	200
8	Elm	7	173	0.77	32	52	84
	Ash	9	222	0.14	41	10	51
	Oak	1	25	0.47	4	32	36
	Basswood	3	74	0.05	14	3	17
	Maple	2	25	0.04	9	3	12
	Total	22	543	1.47	100	100	200
9	Elm	7	173	0 98	30	71	101
	Ash	13	321	0.17	57	12	69
	Maple	2	49	0.14	9	10	19
	Oak	1	25	0.09	4	7	11
	Total	23	568	1.38	99	100	199
10	Ash	18	445	0.22	62	14	76
	Basswood	5	124	0.89	17	57	74
	Oak	3	74	0.39	10	25	35
	Maple	3	74	0.07	lo	4	14
	Total	29	717	1.57	99	100	199
11	Ash	28	692.	0.50	85	24	109
	Cottonwood	2	49	1.02	6	48	54
	Maple	2	49	0.58	6	28	34
	Basswood	1	25	0.004	3	<1	3
	Total Total	33	815	2.104	100	100	200
12	Ash	31	766	0.62	97	98	195
	Elm	1	25	0.01	3	2	5
	Total	32	791	0.63	100	100	200
13	Ash	27	667	0.56	82	91	173
	Elm	2	49	0.05	6	8	14
	Maple	4	99	0.006	12	1	13
	Total	33	815	0.616	100	100	200
14	Elm	7	173	0.49	33	56	89
	Ash	11	272	0.26	52	30	82
	Maple	3	74	0.12	14	14	28
	Total	21	519	0.87	99	100	199

I.4.2 The Number of Trees per Sample Plot, Trees per Hectare, Total Basal Area, Relative Density, Relative Dominance, and Importance Values of each Tree Species Sampled in the Sample Plots located in the Sair Riverbottom Forest

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
1	Basswood	9	222	0.72	24	49	73
	Elm	9	222	0.42	24	28	52
	Ash	12	297	0.11	32	7	39
	Maple	7	173	0.09	18	6	24
	Oak	1	25	0.14	3	9	12
	Total Total	38	939	1.48	101	99	200
2	Basswood	8	198	0.61	40	60	100
	Maple	6	148	0.23	30	23	53
	Ash	5	124	0.16	25	16	41
		1	25	0.01	5	1	6
	Total	20	495	1.01	100	100	200
3	Basswood	15	371	0.82	55	67	112
	Elm	4	99	0.21	15	17	32
	Oak	4	99	0.12	15	10	25
	Ash	4	99	0.08	15	6	21
	Total	27	668	1.23	100	100	200
4	Basswood	10	247	0.51	36	36	72
	Elm	5	124	0.60	18	42	60
	Ash	9	222	0.22	32	15	47
	Maple	2	49	0.07	7	5	12
	Oak	2	49	0.03	7	2	9
	Total	28	691	1.43	100	100	200
5	Basswood	13	321	0.59	34	44	78
	Ash	8	198	0.25	21	19	40
	Elm	9	222	0,20	24	15	39
	Maple	5	124	0.13	13	10	23
	Oak	3	74	0.17	8	13	21
	Total	38	939	1.34	100	101	201
6	Ash	19	469	0.32	76	64	140
	Basswood	3	74	0.12	12	24	36
	Maple	3	74	0.06	12	12	24
	Total	25	617	0.50	100	100	200
7	Elm	7	173	0.66	22	47	69
	Ash	14	346	0.25	45	18	63
	Oak	3	74	0.36	10	25	35
	Maple	4	99	0.06	13	4	17
	Basswood	3	74	0.08	10	6	16
	Total	31	766	1.41	100	100	200

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
8	Elm	12	297	1.06	46	65	
	Ash	12	297	0.39	46	24	70
	Maple	2	49	0.17	8	10	18
	Total	26	643	1.62	100	99	199
9	Elm	9	222	0.55	53	32	85
	Cottonwood	1	25	0.87	6	51	57
	Maple	4	99	0.14	24	8	32
	Ash	2	49	0.07	12	4	16
	Oak	1	25	0.07	6	4	10
	Total	17	420	1.70	101	99	200
10	Elm	9	222	0.44	50	40	90
	Maple	5	124	0.39	28	35	63
	Ash	4	99	0.27	22	25	47
	Total	14	347	0.72	100	100	200
11	Elm	5	124	0.40	36	56	92
	Ash	8	198	0.14	57	19	76
	Basswood	1	25	0.18	7	25	32
	Total	14	347	0.72	100	100	200
12	Ash	12	297	0.29	44	26	70
	Oak	7	173	0.33	26	29	55
	Basswood	4	99	0.43	15	38	53
	Elm	3	74	0.05	11	4	15
	Maple	1	25	0.02	4	2	6
	Total	27	668	1.12	100	99	199
13	Elm	8	198	0,24	42	32	74
	Ash	8	198	0.43	42	57	99
	Maple	2	49	0.07	11	9	20
	Oak	1	25	0.008	5	1	6
	Total	19	470	0.748	100	99	199
14	Elm	16	395	0.34	42	49	91
	Ash	17	420	0.28	45	41	86
	Basswood	3	74	0.03	8	4	12
	Maple	2	49	0.04	5	6	11
	Total	38	938	0.69	100	100	200

I.4.3 The Number of Trees per Sample Plot, Trees per Hectare, Total Basal Area, Relative Density, Relative Dominance, and Importance Values of each Tree Species Sampled in the Sample Plots located in the Jail Riverbottom Forest

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
1	Basswood	3	74	0.19	15	63	78
	Ash	7	173	0.08	35	27	62
	Maple	10	247	0.03	50	10	60
	Total	20	494	0.30	100	100	200
2	Basswood	16	395	1.3	73	88	161
	Maple	4	99	0.06	18	4	22
	Ash	2	49	0.12	9	8	17
	Total	22	543	1.48	100	100	200
3	Maple	17	420	0.8	71	89	160
	Ash	5	124	0.06	21	7	28
	Elm	1	49	0.04	8	4	12
	Total	23	593	0.9	100	100	200
4	Basswood	27	667	1.16	77	75	152
	Ash	6	148	0.37	17	24	41
	Maple	1	49	0.01	6	1	7
	Total	34	864	1.54	100	100	200
5	Basswood	10	247	0.39	38	74	112
	Ash	12	297	0.04	46	8	54
	Maple	3	74	0.09	12	17	29
	Oak	1	25	0.006	4	1	5
	Total	26	642	0.526	100	100	200
6	Basswood	5	124	0.50	20	40	60
	Elm	5	124	0.34	20	27	47
	Ash	10	247	0.05	40	4	44
	Maple	4	99	0,35	16	28	44
	Oak	1	25	0.02	4	2	6
	Total	25	619	1.26	100	101	201
7	Elm	4	99	0.53	20	47	67
	Maple	7	173	0.31	35	27	62
	Ash	7	173	0.31	35	9	44
	Basswood	2	49	0.19	10	17	27
	Total	20	494	1.13	100	100	200

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
8	Basswood	35	865	1.15	71	79	150
	Maple	7	173	0.16	14	11	25
	Ash	7	173	0.14	14	10	24
	Total	49	1211		99	100	199
9	Basswood	7	173	0.78	26	57	83
	Maple	9	222	0.26	33	19	52
	Ash	8	198	0.27	30	20	50
	Oak	1	25	0.03	7	2	9
	Elm	2	49	0.04	4	3	7
	Total	27	667	1.38	100	101	201
10	Cottonwood	4	99	0.70	23.5	48	71.5
	Basswood	6	148	0.49	35	33	68
	Elm	4	99	0.12	23.5	8	31.5
	Ash	2	49	0,06	12	4	16
	Maple	1	25	0.10	6	8	14
	Total	17	420	1.47	100	101	200
11	Maple	8	198	0.33	36	17	53
	Elm	6	148	0.45	27	24	51
	Ash	7	173	0.30	32	16	48
	Cottonwood	1	25	0.83	5	43	48
	Total	22	544	1.91	100	100	200
12	Ash	7	173	0.35	78	71	149
	Elm	2	49	0.14	22	29	51
	Total	9	222	0.49	100	100	200
13	Basswood	6	148	0.51	29	46	75
	Ash	8	198	0.22	38	20	58
	Maple	4	99	0,09	19	8	27
	Elm	2	49	0.13	10	12	22
	Oak	1	25	0.16	5	14	19
	Total	21	519	1.11	101	100	201
14	Ash	17	420	0.30	61	40	101
	Maple	6	148	0.21	21	28	49
	Elm	3	74	0.18	11	24	35
	Basswood	2	49	0.06	7	8	15
	Total	28	691	0.75	100	100	200

I.4.4 The Number of Trees per Sample Plot, Trees per Hectare , Total Basal Area, Relative Density, Relative Dominance, and Importance values of each Tree Species Sampled in the Sample PLots located in the Beaudry Aspen Forest

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
1	Aspen	32	790	0.80	73	77	150
	Elm	5	124	0.15	11	14	25
	Ash	4	99	0.06	9	6	15
	Maple	3	74	0.03	7	3	10
	Total	44	1087	1.04	100	100	200
2	Aspen	15	371	0.52	48	71	109
	Ash	8	198	0.12	26	16	42
	Maple	7	173	0.08	22	11	33
	Oak	1	25	0.01	3	1	4
	Total	34	767	0.73	99	99	198
3	Aspen	12	297	0.49	50	75	125
	Ash	6	148	0.08	25	12	37
	Maple	6	148	0.08	25	12	37
	Total	24	593	0.65	100	99	199
4	Aspen	22	544	0.69	49	65	144
	Ash	15	371	0.20	33	19	52
	Maple	6	148	0.10	13	9	22
	Elm	1	25	0.06	2	6	8
	Oak	1	25	0.01	2	1	3
	Total	45	1113	1.06	99	100	199
5	Aspen	34	840	0.92	76	90	166
	Ash	5	124	0.05	11	5	16
	Maple	5	124	0.05	11	5	16
	Oak	1	25	0.004	2	<1	2
	Total	45	1113	1.024	100	100	200
6	Aspen	59	1458	1.09	86	86	172
	Elm	2	49	0.12	2	9	11
	Ash	4	99	0.03	6	2	8
	Maple	4	99	0.03	6	2	8
	Total	69	1705	1.27	100	99	199

I.4.5 The Number of Trees per Sample Plot, Trees per Hectare, Total Basal Area, Relative Density, Relative Dominance, and Importance Value of Each Tree Species Sampled in the Sample Plots located in the Beaudry Oak Forest

Sample Plot Number	Species	Number of Trees per Plot	Trees per Hectare	Total Basal Area (m^2)	Relative Density (D)	Relative Dominance (Do)	Importance Value (D+Do)
1	Bur Oak	66	264	0.88	100	100	200
2	Bur Oak	69	276	1.21	100	100	200
3	Bur Oak	51	204	0.69	100	100	200
4	Bur Oak	62	248	0.86	100	100	200
5	Bur Oak	54	216	0.66	100	100	200
6	Bur Oak	52	208	0.79	100	100	200
7	Bur Oak	72	288	0.71	100	100	200
8	Bur Oak	56	224	0.87	100	100	200
9	Bur Oak	48	192	0.95	100	100	200
10	Bur Oak	43	172	1.03	100	100	200
11	Bur Oak	31	124	0.63	100	100	200
12	Bur Oak	45	180	0.91	100	100	200
13	Bur Oak	52	208	0.84	94	94	188
	Green Ash	3	12	0.05	6	6	12
	Total	55	220	0.89	100	100	200

I.5 The Average Height of the Upper Tree Canopy in the Sample Plots Located in the Beaudry, Sair, and Jail Riverbottom Forests and the Beaudry Aspen and Beaudry Oak Forests

Beaudry Riverbottom Forest		Sair Riverbottom Forest		Jail Riverbottom Forest	
Sample Plot Number	Average Height of the Upper Canopy (m)	Sample Plot Number	Average Height of the Upper Canopy (m)	Sample Plot Number	Average Height of the Upper Canopy (m)
1	17	1	18	1	22
2	16	2	21	2	22
3	16	3	14	3	22
4	16	4	19	4	25
5	23	5	25	5	20
6	23	6	23	6	23
7	21	7	21	7	23
8	21	8	20	8	17
9	21	9	24	9	23
10	19	10	27	10	28
11	29	11	19	11	28
12	14	12	20	12	23
13	17	13	18	13	23
14	22	14	20	14	15

The Average Height of the Upper Tree Canopy in the Sample Plots Located in the Beaudry Oak Forest

Sample Plot Number	Average Height of the Upper Canopy (m)
1	11
2	10
3	7
4	9
5	9
6	9
7	8
8	11
9	11
10	11
11	11
12	11
13	11

The Average Height of the Upper Tree Canopy in the Sample Plots Located in the Beaudry Aspen Forest

Sample Plot Number	Average Height of the Upper Canopy (m)
1	17
2	17
3	16
4	18
5	17
6	17

I.6 The Number and Relative Abundance of Each Small Mammal Species Caught in Each of the Small Mammal Sampling Plots Established in the Woodland and Grassland Small Mammal Study Areas of Beaudry Provincial Park*

Species	Beaudry Riverbottom Forest[a]					Sair Riverbottom Forest[a]					Jail Riverbottom Forest[b]				Beaudry Aspen Forest				
	Trap-Night** 1	2	3	Total Captured	Relative Abundance	Trap-Night** 1	2	3	Total Captured	Relative Abundance	Trap-Night** 1	2	3	Total Captured	Relative Abundance	Trap-Night** 1	2	3	Total Captured	Relative Abundance
Shrew																				
Sorex sp.											1			1	2					
Northern Flying Squirrel																				
Glaucomys sabrinus																				
Deer Mouse																				
Peromyscus maniculatus	12	15	12	39	66	19	19	17	55	59	11	15		26	38	6	10	5	21	43
Gapper's Red-Backed Vole																				
Clethrionomys gapperi	2	9	9	20	34	17	8	14	39	41	18	23		41	60	11	7	10	28	57
Meadow Vole																				
Microtus pennsylvanicus																				
Meadow Jumping Mouse																				
Zapus hudsonicus																				
	14	24	21	59	100	36	27	31	94	100	29	39		68	100	17	17	15	49	100

*All Small Mammal Sampling Plots were 0.44 hectares in size in the Woodland Study areas, 0.08 hectares in the Retention Pond Prairie and the Inactive Stream bed, and 0.05 hectares in the Upland Disturbed Meadow Study area.

**All Small Mammal Plots consisted of a 7 m x 7 m grid and used ninety (90) Museum Special Snap Traps in the Woodland Study Areas, a 7 m x 7 m grid and used sixteen (16) Museum Special Snap Traps in the Retention Pond Prairie and Inactive Streambed, and a 7 m x 7 m grid using ten (10) Museum Special Snap Traps in the Upland Disturbed Meadow.

[a] The Small Mammal Plot was located in a Breeding-Bird Census Plot.

[b] The traps were set out for a total of two nights rateher than three nights as a result of severe weather constraints.

Species	Beaudry Oak Forest					Retention Pond Prairie						Inactive Streambed			Upland Disturbed Meadow		
	Trap-Night** 1	2	3	Total Captured	Relative Abundance	Trap-Night** 1	2	3	4	Total Captured	Relative Abundance	Trap-Night** 1	Total Captured	Relative Abundance	Trap-Night** 1	Total Captured	Relative Abundance
Shrew *Sorex sp.*		1		1	33	1				1	14				2	2	67
Northern Flying Squirrel *Glaucomys sabrinus*		1		1	33												
Deer Mouse *Peromyscus maniculatus*							2			2	29						
Gapper's Red-Backed Vole *Clethrionomys gappari*												2	2	50			
Meadow Vole *Microtus pennsylvanicus*						1		2	1	4	57	2	2	50	1	1	33
Meadow Jumping Mouse *Zapus hudsonicus*		1		1	33												
Total:	2	1		3	99	2	2	2	1	7	100	4	4	100	3	3	100

*All Small Mammal Sampling Plots were 0.44 hectares in size in the Woodland Study areas, 0.08 hectares in the Retention Pond Prairie and the Inactive Stream bed, and 0.05 hectares in the Upland Disturbed Meadow Study area.

**All Small Mammal Plots consisted of a 7 m x 7 m grid and used ninety (90) Museum Special Snap Traps in the Woodland Study Areas, a 7 m x 7 m grid and used sixteen (16) Museum Special Snap Traps in the Retention Pond Prairie and Inactive Streambed, and a 7 m x 7 m grid using ten (10) Museum Special Snap Traps in the Upland Disturbed Meadow.

Appendix J

GENETIC PROFILES FOR EACH SOIL SERIES OF BEAUDRY PROVINCIAL PARK

DENCROSS SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervescence
1	L-H	4-0	10YR 2/2 d.			
2	Ah	0-15	2.5 Y 3/1 d.	clay	fine granular	none
3	ACkgj	15-28	2.5Y 4/1 d.	clay loam	fine granular	weakly calcareous
4	Ckgj 1	28-42	2.5Y 7/1 d.	loam	fine granular	strongly calcareous
5	Ckgj 2	42 +	2.5Y 7/1 d.	silty clay loam	massive to fine granular	very strongly calcareous

FISHER SERIES

Horizon	Designation	Depth (cm)	Color [1]	Texture	Structure	Effervescence
1	Ah	0-10	light gray to dark gray	silty clay loam to clay loam	fine granular	weakly calcareous
2	Cgj	10 +				very strongly calcareous

FORT GARRY SERIES

Horizon	Designation	Depth (cm)	Color	Texture	Structure	Effervescence
1	Ah	0-18	10YR 2/1 d.	silty clay	fine granular	none
2	Bm	18-46	2.5Y 5/2 d.	clay	fine prismatic to coarse granular	none
3	BCk	46-52	10YR 4/3 d.	clay	medium to coarse granular	none
3						
4	IIBCk	52-58	2.5Y 6/2 d.	stratified silty clay to silty clay	fine pseudo platy	strongly calcareous
5	IICk 1	58-80	10YR 5/3 m.-10YR 8/2	silty clay loam to clay	fine pseudo platy	very strongly calcareous
6	IICk 2	80-100	stratified brown to grayish brown	silt loam to clay	fine pseudo platy	very strongly calcareous
7	IICk 3	100-135	2.5Y 7/2 d.	silt loam to silty clay loam	fine platy	very stongly calacreous

OSBORNE SERIES

Horizon	Designation	Depth(cm)	Color	Texture	Structure	Effervescence
1	Ap	0-10	5Y 2/1 d.	clay	massive to medium granular	none
2	Acg	10-15	5Y 3/1 to 5Y 4/2 d.	clay	massive to fine granular	none
3	Ckg 1	15-30	5Y 4/1 d.	clay	massive	weakly calcareous moderately
4	Ckg 2	30-60	5Y 4/1 d.	clay	massive	calcareous moderately
5	Ckg 3	60-90	5Y 4/1 d.	clay	massive	calcareous

RED RIVER SERIES

Horizon	Designation	Depth(cm)	Color	Texture	Structure	Effervescence
1	Ap	8-12	2.5Y 3.5/0 d.	silty clay to clay	fine granular	none
2	Ah	12-22	2.5Y 3.5/1 d.	clay	fine granular	none moderately
3	ACkgj	22-30	2.5Y 6/1 d.	clay	fine granular to amorphous	calcareous moderately
4	Ckgj	30-90	2.5Y 6/1 d.	clay	amorphous	calcareous

ST. NORBERT SERIES

Horizon	Designation	Depth(cm)	Color	Texture	Structure	Effervescence
1	L-H	3-0				none
2	Ahe	0-8	10YR 5/1 d.	clay	fine granular	none
3	AB	8-10	10YR 5/1 d.	clay	fine granular	none
4	Btj	10- 25	10YR 4/1 d.	clay	fine granular	none
5	Bm	25-45	10YR 3/1 d.	clay	fine subangular blocky	weakly calcareous
6	BCk	45-60	5Y 5/2 d.	clay	massive to coarse granular	weakly calcareous
7	Ckg 1	60-90	5Y 5/2 d.	clay	massive	moderately
8	Ckg 2	90-180	5Y 5/2 to 5Y 6/2 d.	clay		calcareous

SCANTERBURY SERIES

Horizon	Designation	Depth(cm)	Color	Texture	Structure	Effervescence
1	Ap	0-18	10YR 3/1 d.	clay	fine granular	none
2	Bm	18-36	10YR 3/1 to 10YR 3/2 d.	clay	medium prismatic to coarse granular	none
3	BCkgj	36-68	10YR 3/2,and 2.5Y 3/2 d.	clay	coarse granular	weakly calcareous
4	Ckgj	68-100	5Y 5/2 d.	clay	massive	moderately calcareous

SEINE RIVER SERIES

Horizon	Designation	Depth(cm)	Color	Texture	Structure	Effervescence
1	L-H	4-0				
2	Ah	0-6	dark gray[1]			
3	Cgj	6 +		silty clay to clay		

Source: Michalyna et al., 1975

Appendix K

RATINGS AND LIMITATIONS OF SOILS IN
BEAUDRY PROVINCIAL PARK FOR
RECREATIONAL USE

Map Symbol	Soil Series	Intensive Picnic Area	Intensive Camp Area	Paths and Trails	Soil Features Affecting Use
Dc	Dencross clay	Severe	Severe	None to Slight	Poorly drained; subject to ponding; sticky and slippery when wet
Fc	Fort Garry clay	Moderate	None to Slight	None to Slight	Well drained, clay surface is slippery and sticky if wet
Fi	Fisher silty clay loam	Moderate	Moderate	None to Slight	subject to ponding; occasional flooding
Nc	St. Norbert clay	Moderate	None to Slight	None to Slight	Well drained, gently sloping; occasional ponding
Oc	Osborne clay	Severe	Severe	Severe	Poorly drained, ponding; sticky and slippery when wet
Rr	Red River clay	Severe	Severe	Moderate	Somewhat poorly drained; subject to ponding; slow to very slow permeablility; sticky and slippery when wet
Sc	Scanterbury clay	Severe	Moderate	None to Slight	Somewhat poorly drained; subject to ponding; very sticky when wet
Sr	Seine River clay	Severe	Severe	None to Slight	Subject to occasional flooding; sticky and slippery when wet

Ratings:

None to Slight - means the soil is very suitable for the particular use

Moderate - means the soil has limitations in use but it can be used under good management

Severe - means the soil has limiting characteristics that make its use for recreation purposes unsoud or very expensive. Use of these soils often requires major soil reclamation work

Appendix L

RECORD OF DAILY MAXIMUM AND MINIMUM TEMPERATURES AND DAILY RAINFALL FOR SUMMER, 1977

Date	May			June			July			August		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
1	13.3	- 0.6	6.4	17.6	8.1	12.9	22.4	10.0	16.2	21.0	8.8	.4.9
2	20.7	- 1.2	9.8	23.0	5.6	14.3	27.6	9.2	18.4	23.5	12.5	.8.0
3	26.3	7.2	16.8	23.6	14.2	18.9	24.9	16.2	20.6	21.0	9.0	.5.0
4	20.8	12.6	16.7	25.1	9.9	17.5	27.3	15.1	21.2	22.8	10.4	.6.6
5	15.0	1.6	8.3	17.9	11.2	14.6	28.1	18.5	23.3	20.0	11.4	.5.7
6	10.2	0.4	5.3	25.2	7.6	16.4	27.9	17.6	22.8	25.3	10.5	.7.9
7	19.0	- 1.8	8.6	24.5	12.7	18.6	26.2	13.0	19.6	18.9	8.7	.3.8
8	25.9	6.5	16.2	20.3	0.8	13.6	21.0	10.2	15.6	23.8	9.8	16.8
9	27.3	11.5	19.4	22.5	10.6	16.6	23.6	9.5	16.6	28.9	10.4	19.7
10	31.0	15.1	23.1	19.4	12.5	16.0	26.3	14.7	20.5	15.4	7.8	11.6
11	30.0	13.7	21.9	16.0	10.8	13.4	21.9	15.8	18.9	23.7	6.1	14.9
12	32.2	15.3	23.8	18.7	8.3	13.5	25.5	14.4	20.0	18.8	6.6	12.7
13	32.6	14.8	23.7	16.3	11.5	13.9	20.1	14.8	17.5	18.3	5.5	11.9
14	29.7	17.6	23.7	16.9	10.5	13.7	22.5	13.2	17.9	21.3	7.6	14.5
15	29.7	15.9	22.8	22.8	14.8	18.8	25.5	12.0	18.8	21.4	9.5	15.5
16	23.6	10.9	17.3	22.7	14.9	18.8	26.0	14.8	20.4	19.0	6.0	12.5
17	22.0	10.3	16.2	18.3	12.7	15.5	30.5	12.0	21.3	18.4	5.0	11.7
18	22.9	11.1	17.0	22.2	11.4	16.8	31.6	17.8	24.7	22.4	5.2	13.8
19	23.2	14.2	18.7	18.2	11.4	14.8	26.0	13.4	19.7	24.6	6.8	15.7
20	21.4	12.2	16.8	25.7	9.8	17.8	24.0	10.2	17.1	20.9	8.7	14.8
21	24.8	9.1	17.0	25.4	12.2	18.8	25.7	11.3	18.5	20.2	5.2	12.7
22	18.2	13.5	15.9	23.9	14.2	19.1	30.4	14.1	22.3	16.2	4.6	.0.4
23	24.2	12.2	18.2	26.4	16.0	21.2	29.4	15.2	22.3	17.3	2.0	9.7
24	29.5	13.0	21.3	26.1	14.3	20.2	25.6	11.4	18.5	20.5	6.0	.3.3
25	31.7	20.2	26.0	29.5	12.5	21.0	23.8	8.3	16.1	22.5	13.8	.8.2
26	28.8	17.8	23.3	24.9	11.7	18.3	27.0	9.9	18.5	21.5	9.2	.5.4
27	26.7	16.6	21.7	24.2	9.6	16.9	25.5	13.4	19.5	20.6	8.4	.4.5
28	23.9	15.9	19.9	23.9	12.8	18.4	27.7	12.4	20.1	18.0	7.0	.2.5
29	23.9	13.0	18.5	22.3	10.4	16.4	23.2	8.5	15.9	22.9	5.1	.4.0
30	23.0	13.8	18.4	17.5	11.1	14.3	23.2	14.4	18.8	21.2	11.8	6.5
31	25.0	13.2	19.1				24.9	12.4	18.7	14.2	7.4	0.8

Date	May	June	July	August
1			10.1	4.8
2	4.2	1.6		
3	50.8	Tr.	Tr.	8.6
4	14.8	3.4	6.2	1.3
5	0.4		Tr.	13.8
6		Tr.	3.6	0.4
7			Tr.	1.0
8	Tr.	Tr.		6.0
9		14.0	2.3	2.8
10			4.3	1.8
11		7.0	Tr.	0.2
12	0.4	15.6	41.0	
13	9.6	1.0	Tr.	
14	0.9	1.6		1.4
15		Tr.	Tr.	1.2
16	Tr.	28.5	0.5	
17	29.6	0.6	Tr.	
18	1.0	1.0	Tr.	0.4
19				0.4
20				3.0
21	1.6			1.2
22	0.6		Tr.	
23			Tr.	
24				13.4
25	37.1			Tr.
26	0.2	2.0		
27	21.0	2.0	1.6	0.5
28	4.7	2.2	Tr.	18.6
29	0.8	7.9	15.0	
30	Tr.		0.7	8.8
31	177.7	88.4	85.3	89.6

Source: Fisheries and Environment Canada, 1977

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